

**FINAL REPORT  
HALF MOON BAY  
AND SOUTH BEACH  
BENTHIC INVERTEBRATE STUDY**

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## **1.0 INTRODUCTION**

In February 2004, the U.S. Army Corps of Engineers, Seattle District (USACE) placed approximately 25,000 cubic yards of sandy dredged material along a 700-foot long stretch of shoreline in Half Moon Bay, Westport, Grays Harbor County, Washington (Figure 1). Accelerated erosion in Half Moon Bay threatens the fill placed at the south jetty where a breach occurred in 1994, and was re-nourished in 2002. The interim sand placement in 2004 is intended to prevent another breach from forming and threatening the stability of the south jetty and federal navigation channel until a long-term maintenance strategy is implemented. Prior to placement of this material, Science Applications International Corporation (SAIC) assisted the USACE in obtaining baseline data on benthic invertebrates in and adjacent to the project footprint.

This report provides a summary of the second phase of benthic invertebrate community measurements in Half Moon Bay, South Beach, and subtidal, open-water disposal sites adjacent to Half Moon Bay. This post-placement data, collected in June 2004 will be used to document changes in population density and community composition from the January 2004 baseline data, which may have occurred as a result of the placement.

### **1.1 Project Goals and Objectives**

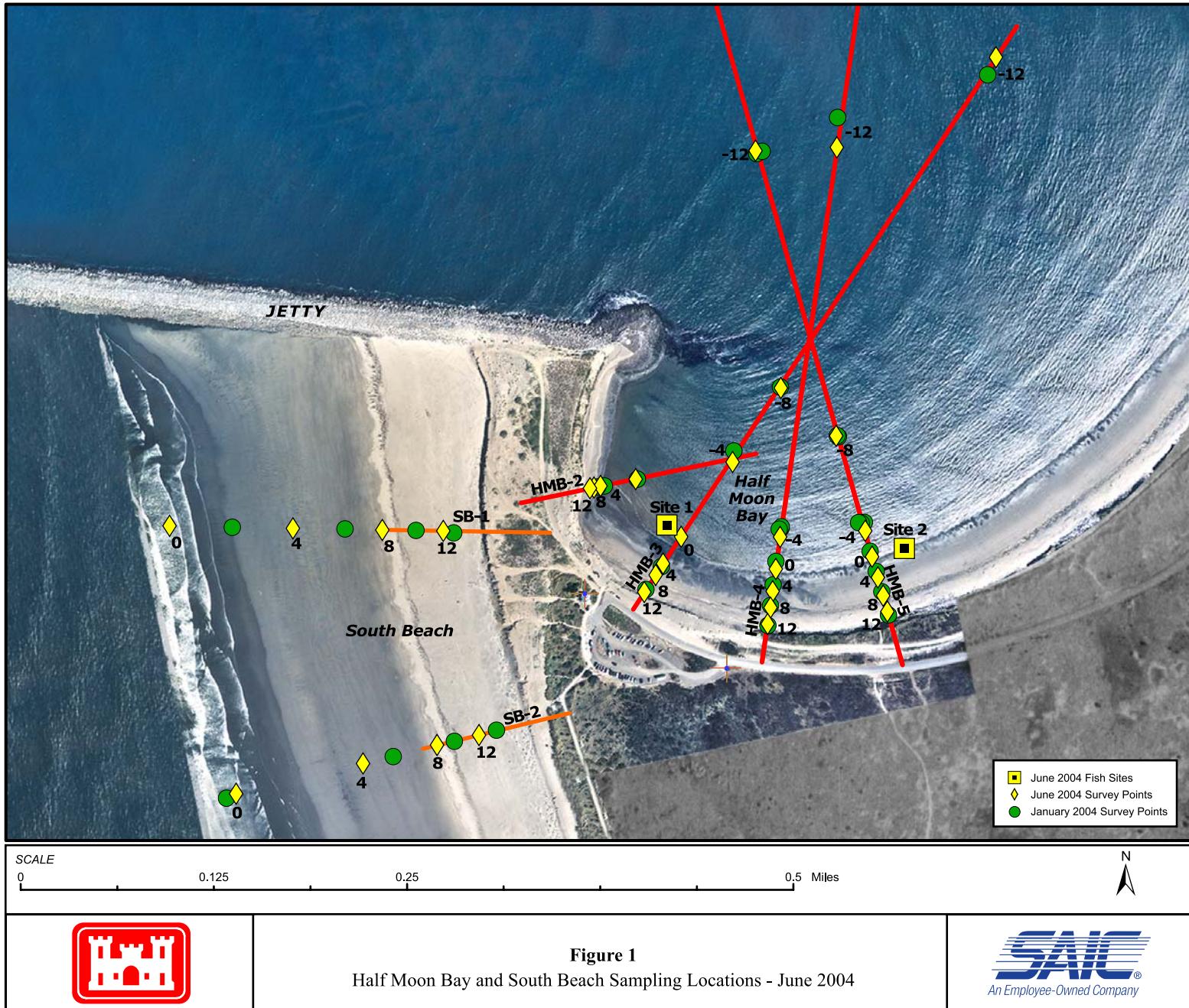
The primary goal of this project is to determine whether the placement of 25,000 cubic yards of sandy dredged material along a 700-foot long stretch of shoreline in Half Moon Bay has altered or impacted the structure and function of the intertidal and shallow subtidal benthic infaunal communities in Half Moon Bay. An additional goal is to assess the relative importance of Half Moon Bay as a juvenile Chinook salmon feeding area during outmigration. To accomplish these goals the following objectives were identified.

- **Objective 1:** Characterize the benthic community at Half Moon Bay and at South Beach for the June 2004 sampling period.

This objective was accomplished by collecting core samples from 29 stations in Half Moon Bay and South Beach. The samples were processed and infaunal organisms were identified to the lowest possible taxonomic level. The resulting benthic community data were analyzed and the results are summarized below.

- **Objective 2:** Determine the nature and degree of changes in benthic population densities and community composition at Half Moon Bay following placement of fill in the project footprint.

To determine whether the benthic community at Half Moon Bay had been altered by the placement of fill, the abundance and numbers of taxa of each major taxonomic group at each station sampled in June 2004 were summarized and compared to data from the same station sampled previously in January 2004 using nonparametric analysis of variance techniques.



- **Objective 3:** Identify the dominant and subdominant species at stations sampled in June 2004 and determine whether these species had changed as a result of the placement of sandy dredged material in Half Moon Bay.

This objective was accomplished by rank ordering the species level data to identify the dominant and subdominant species. Data from the January and June sampling periods were summarized and the resulting data tables were analyzed to determine if there had been a change in the dominant species as a result of the placement of dredged material.

- **Objective 4:** Assess the relative invertebrate production of these shorelines as related to provision of food organisms for juvenile salmonids, forage fish, juvenile flatfish, and shorebirds.

This objective was accomplished by analyzing the stomach content of 60 fish from the predominant fish species present in Half Moon Bay, including the Chinook salmon, Starry flounder, surf smelt, shiner perch, speckled sanddab, sand lance, English sole, Pacific herring, American shad, and sand sole. Invertebrates consumed by the fish were compared to benthic organisms present in Half Moon Bay.

## **2.0 METHODS**

### **2.1 Benthic Invertebrate Sampling and Analysis**

This second phase of benthic invertebrate sampling at Half Moon Bay and South Beach, Westport, Washington was conducted by SAIC on June 29 and 30 and July 1, 2004. Intertidal core samples were collected at thirteen sample sites in western Half Moon Bay and eight sites on South Beach (Figure 1). Intertidal benthic samples were collected at four elevations (+12 feet, +8 feet, +4 feet, and 0 feet MLLW) and were collected by hand at low tide. Subtidal core samples were collected at eight sample sites in western Half Moon Bay. Subtidal benthic samples were collected at three elevations (-4 feet, -8 feet, and -12 feet MLLW) at high tide using the M/V *Shoalhunter*. A modified 0.1 m<sup>2</sup> Young van Veen sampler was deployed from the M/V *Shoalhunter* to collect subtidal samples. A summary of station coordinates and elevations is provided in the Field Data Summary (Appendix A).

At each intertidal and subtidal station, a total of ten replicate core samples were collected. The samples were collected using a cylindrical coring device 5 cm in diameter and 15 cm long. For subtidal samples, the coring device was inserted into the van Veen sampler to collect samples similar in size to the intertidal samples. The number of samples collected and analyzed is summarized in Table 1. A minimum of three replicates from each station were analyzed for benthic infauna. At three of the Half Moon Bay stations, all ten replicates were analyzed.

Each sediment core sample was preserved in 10% formalin solution in the field and transferred to 70% ethanol prior to analysis. Samples to be archived were also transferred to 70% ethanol for long-term storage. Samples that were analyzed were washed through a series of nested sieves of 1.0 mm, 0.5 mm, and 0.25 mm. Each fraction was retained in separate containers and

**Table 1.** Number of samples collected and analyzed.

Transect	Elev. (ft)	Sample ID	Replicate Samples	Replicates Analyzed	Grain Size Analysis
<b>Half Moon Bay Intertidal</b>					
HMB2	0	HMB2+0	10	10	1
HMB2	4	HMB2+4	10	3	1
HMB3	0	HMB3+0	10	3	1
HMB3	4	HMB3+4	10	3	1
HMB3	8	HMB3+8	10	3	1
HMB4	0	HMB4+0	10	3	1
HMB4	4	HMB4+4	10	3	1
HMB4	8	HMB4+8	10	10	1
HMB4	12	HMB4+12	10	3	1
HMB5	0	HMB5+0	10	3	1
HMB5	4	HMB5+4	10	3	1
HMB5	8	HMB5+8	10	3	1
HMB5	12	HMB5+12	10	3	1
<b>Half Moon Bay Subtidal</b>					
HMB3	-4	HMBsub1	10	3	1
HMB3	-8	HMBsub2	10	3	1
HMB3	-12	HMBsub3	10	3	1
HMB4	-4	HMBsub4	10	3	1
HMB4	-12	HMBsub5	10	3	1
HMB5	-4	HMBsub6	10	3	1
HMB5	-8	HMBsub7	10	10	1
HMB5	-12	HMBsub8	10	3	1
<b>South Beach Intertidal</b>					
SB1	0	SB1+0	10	3	1
SB1	4	SB1+4	10	3	1
SB1	8	SB1+8	10	3	1
SB1	12	SB1+12	10	3	1
SB2	0	SB2+0	10	3	1
SB2	4	SB2+4	10	3	1
SB2	8	SB2+8	10	3	1
SB2	12	SB2+12	10	3	1
<b>Totals:</b>			<b>290</b>	<b>108</b>	<b>29</b>

submitted to Columbia Sciences, of Royston B.C., for identification and enumeration. The number of individuals of each species, total number of individuals, number of individuals by major taxa, total wet weight biomass, and wet weight biomass by major taxa were reported for each sample. The laboratory data report is provided in Appendix B. A quality assurance (QA) review of the benthic data performed by SAIC is provided in Appendix C.

Samples to be archived were washed through the 0.25 mm sieve only. The archived samples will remain in custody of SAIC until the completion of this study, after which any archived benthic samples will be transferred to the USACE. Some or all of the archived samples may be analyzed at a later date, depending on the results of the data comparison between the baseline analysis, the current analysis and/or future monitoring surveys. At each intertidal and subtidal station, a separate sediment sample was also collected and submitted to Soil Technology of Bainbridge Island, Washington for grain size analysis (Appendix D).

## **2.2 Benthic Invertebrate Data Evaluation**

Analysis of benthic community structure was conducted for the June 2004 data to characterize the community following the placement of fill material to stabilize the south jetty in Half Moon Bay. The benthic community data is being compared to baseline conditions measured in January 2004 (USACE, 2004) to determine whether the community post maintenance fill is similar to the baseline conditions.

Biological endpoints were calculated to reduce the data into simple numerical relationships for descriptive purposes and for comparison to pre-maintenance fill data. The biological data by station were summarized by pooled abundance, mean, and standard deviation. The following metrics were included in the analysis:

- Abundance, numbers of taxa (richness), and biomass
  - Total
  - Miscellaneous
  - Mollusca
  - Arthropoda
  - Annelida
  - Ectoprocta
  - Insecta
- Dominant taxa at each station

These endpoints were selected for analysis because they are sensitive to detecting changes in benthic communities due to human activity and natural environmental stresses (Striplin and Musgrove, 1999). Long species list often contain confusing and seemingly contradictory data; reducing these lists to manageable levels allows trends in species distributions to be identified. The species level taxonomic data were used to identify which species or groups of species dominated the infaunal community at Half Moon Bay and South Beach. The use of a dominant species list in concert with the above benthic community endpoints will allow the detection of potential changes to the benthic community due to the placement of material to shore up the South Jetty.

The benthic data for the June sampling period has been summarized below. The Ectoprocta and the Insecta will not be discussed in the context of the benthic community evaluation, but will be included in the data as part of the fish stomach content evaluation. Data from the January sampling period was previously summarized in USACE (2004).

Statistical testing was conducted using the SYSTAT statistical software package (SYSTAT, Ver.11). The following analyses were carried out: Tests for normality, Paired Students *t*-tests and the Kruskal-Wallis nonparametric analysis of variance. Pierson correlation coefficients were calculated to determine if there was a relationship between the sediment grain size and the benthic community endpoints. The *t*-tests results were to be reported only if the normality tests indicated that the data were normally distributed.

## **2.3 Intertidal Bivalve Sampling**

A semi-quantitative assessment of bivalves in the lower intertidal zone of Half Moon Bay was conducted on July 1, 2004, by excavating sediments along the four station transects at 0 feet MLLW (HMB2, HMB3, HMB4, and HMB5). A 0.25 m<sup>2</sup> quadrat made of PVC was placed randomly at each site, and sediment was excavated from within the quadrat to a depth of at least 30 cm. The sediment was washed through a 2.0 mm sieve and inspected for bivalves.

Significant amounts of fine shell debris were retained within the sieve at each station. However, the only living bivalves detected during these surveys were one heart cockle (*Clinocardium nuttallii*) and two soft-shell clams (*Mya arenaria*) observed at station HMB2 +0 (transect HMB2, 0 feet MLLW elevation). Additional biological observations during sampling are provided in the Field Data Summary (Appendix A).

## **3.0 RESULTS**

The following sections provide a summary of the benthic infauna community and sediment grain size results in Half Moon Bay and South Beach observed in June 2004. The raw data for the benthic infaunal analysis and sediment grain size analysis are provided in Appendix B and D, respectively. Comparisons between the January baseline and June sampling periods are provided in Section 3.4.

### **3.1 Half Moon Bay Benthic Infauna**

Benthic infauna samples were collected at 21 stations within Half Moon Bay. Triplicate samples were analyzed at all stations, with the exception of stations HMB2 +0, HMB4 +8, and HMB5 -8, where ten replicate samples were analyzed (Table 1). Each sample consisted of three size classes (1.0 mm, 0.5 mm, and 0.25 mm). Benthic organisms in each size class were identified to the lowest possible taxon and the number of individuals counted. Organism counts were also pooled based on adult versus juvenile identification.

For both the January and June benthic surveys, adult organisms were found primarily in the 1.0 mm and 0.5 mm size classes, but at relatively low abundances relative to juveniles. Juveniles in the 0.25 mm size class dominated abundance measurements, particularly for the June survey. To

maintain consistency for comparisons between sampling events, the benthic infauna data results (Appendix B) and the summary tables in the following sections are organized into three categories: 1) pooled adult and juvenile data, 2) juvenile data only, and 3) adult data only.

### **3.1.1 Pooled Adult and Juvenile**

Mean abundance and number of taxa (pooled to include both adult and juvenile organisms) for stations sampled in Half Moon Bay are summarized in Table 2. Abundance and number of taxa by major taxonomic group (phylum) are also provided. Values are reported per the surface area collected by the 5 cm diameter core sampler ( $19.6 \text{ cm}^2$ ).

Total abundance and total number of taxa in Half Moon Bay varied mainly by elevation and were generally higher at subtidal locations (-4 to -12 feet MLLW) than at intertidal stations (0 to +12 feet MLLW). Intertidal stations had a mean total abundance of 15.9 individuals per sample ( $19.6 \text{ cm}^2$  area) and a mean total number of taxa of 3.4. Abundance was dominated by the annelids and the miscellaneous phyla, although at lower abundances relative to the subtidal stations (Table 2). Subtidal stations had a mean total abundance of 125.0 individuals per sample and a mean total number of taxa of 9.6. Although the subtidal stations had higher species richness, the abundance was still dominated primarily by annelids and the miscellaneous phyla.

For all transects, highest mean abundance was observed at the -12 feet MLLW elevation. Station HMB4 -12 had the greatest mean total abundance observed at 287.3 individuals (Table 2), with abundance dominated by the annelid of the genus *Saccocirrus*, with a mean of 253.7 individuals (Table 3). The highest mean for total number of taxa observed at all stations occurred at -4 feet MLLW. Station HMB4 -4 had the greatest mean total number of taxa observed at 16.0, with mean abundance greater than 10 individuals for five different species groups per sample. The subtidal stations along the -4, -8, and -12 feet MLLW elevations were strongly dominated by annelids, except at station HMB3 -8, where the abundance for annelids and miscellaneous phyla were comparable. Annelids were present at 23.7 individuals per sample, and the miscellaneous phyla were present at 17.7 individual per sample.

The lowest mean for total abundance (0.7) and total number of taxa (0.7) were observed at the +12 feet MLLW elevation. In the intertidal region, the mean abundance was dominated by the annelids and the miscellaneous phyla, although at low abundance. The mean abundances ranged from 0.7 (HMB4 +12) to 7.0 (HMB4 +4) individuals per sample for the annelids, and 0.7 (HMB4 +12) to 39.7 (HMB3 +4) individuals per sample for the miscellaneous phyla. In general, mean total abundance followed a pattern similar to the number of taxa observed at each tidal height. On average, both mean total abundance and the mean number of taxa observed increased with a decrease in tidal height from +12 feet to -8 feet MLLW. The only tidal height that breaks from this trend is -12 feet MLLW, where the number of taxa observed decreased while mean total abundance increased.

The ribbon worm (Nemertea indet.) was the most abundant organism at 15 of the 21 stations within Half Moon Bay (Table 3). The annelid of the genus *Saccocirrus* was the most abundant at 3 stations (HMB3 -12, HMB4 -12, and HMB5 -12). Opheliidae indet. and Harpacticoida were

**Table 2. Half Moon Bay mean abundance and taxa per sample (19.6 cm<sup>2</sup>) – Combined adults and juveniles.**

Station	HMB2 +4	HMB2 +0*				
Total Abundance	14.33	34.10				
Annelida Abundance	6.00	4.50				
Arthropoda Abundance	0.67	12.30				
Mollusca Abundance	0.00	2.10				
Miscellaneous Abundance	7.67	14.20				
Ectoprocta Abundance	0.00	0.60				
Insecta Abundance <sup>†</sup>	0.00	0.40				
Total No. of Taxa	6.67	10.40				
Annelida No. Taxa	4.33	3.30				
Arthropoda No. Taxa	0.67	3.30				
Mollusca No. Taxa	0.00	0.60				
Miscellaneous No. Taxa	1.67	2.50				
Ectoprocta Abundance	0.00	0.50				
Insecta Abundance <sup>†</sup>	0.00	0.20				
Station	HMB3 +8	HMB3 +4	HMB3+0	HMB3 -4	HMB3 -8	HMB3 -12
Total Abundance	18.33	41.67	19.33	36.33	47.33	164.33
Annelida Abundance	5.67	2.00	2.67	19.33	23.67	150.33
Arthropoda Abundance	0.33	0.00	1.00	5.33	4.67	4.00
Mollusca Abundance	0.00	0.00	0.00	2.00	1.33	1.33
Miscellaneous Abundance	12.00	39.67	15.67	9.67	17.67	8.67
Ectoprocta Abundance	0.00	0.00	0.00	0.00	0.00	0.00
Insecta Abundance <sup>†</sup>	0.33	0.00	0.00	0.00	0.00	0.00
Total No. of Taxa	2.33	2.33	4.00	8.67	10.33	7.67
Annelida No. Taxa	0.67	1.00	2.00	5.33	6.33	3.33
Arthropoda No. Taxa	0.33	0.00	1.00	1.00	1.33	2.67
Mollusca No. Taxa	0.00	0.00	0.00	1.00	1.00	0.67
Miscellaneous No. Taxa	1.00	1.33	1.00	1.33	1.67	1.00
Ectoprocta Abundance	0.00	0.00	0.00	0.00	0.00	0.00
Insecta Abundance <sup>†</sup>	0.33	0.00	0.00	0.00	0.00	0.00

**Table 2. Half Moon Bay mean abundance and taxa per sample (19.6 cm<sup>2</sup>) – Combined adults and juveniles (continued).**

<b>Station</b>	HMB4 +12	HMB4 +8*	HMB4 +4	HMB4 +0	HMB4 -4	**	HMB4 -12
Total Abundance	1.33	6.70	16.00	12.67	104.67		287.33
Annelida Abundance	0.67	3.10	7.00	6.67	34.00		257.00
Arthropoda Abundance	0.00	0.00	0.00	0.00	57.00		1.00
Mollusca Abundance	0.00	0.00	0.00	0.00	11.00		1.33
Miscellaneous Abundance	0.67	3.60	9.00	6.00	2.67		28.00
Ectoprocta Abundance	0.00	0.00	0.00	0.00	0.00		0.00
Insecta Abundance <sup>†</sup>	0.00	0.00	0.00	0.00	0.00		0.00
Total No. of Taxa	1.00	1.80	4.67	3.33	16.00		7.67
Annelida No. Taxa	0.67	0.90	3.00	2.00	5.67		4.33
Arthropoda No. Taxa	0.00	0.00	0.00	0.00	8.00		1.00
Mollusca No. Taxa	0.00	0.00	0.00	0.00	1.33		1.33
Miscellaneous No. Taxa	0.33	0.90	1.67	1.33	1.00		1.00
Ectoprocta Abundance	0.00	0.00	0.00	0.00	0.00		0.00
Insecta Abundance <sup>†</sup>	0.00	0.00	0.00	0.00	0.00		0.00
<b>Station</b>	HMB5 +12	HMB5 +8	HMB5 +4	HMB5 +0	HMB5 -4	HMB5 -8*	HMB5 -12
Total Abundance	0.67	14.00	10.67	16.67	46.67	48.10	265.33
Annelida Abundance	0.67	3.00	3.00	0.33	21.67	19.80	198.00
Arthropoda Abundance	0.00	0.00	0.00	0.33	5.33	12.50	3.00
Mollusca Abundance	0.00	0.00	0.00	0.00	1.00	3.50	0.67
Miscellaneous Abundance	0.00	11.00	7.67	16.00	18.67	12.20	63.67
Ectoprocta Abundance	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insecta Abundance <sup>†</sup>	0.00	0.00	0.00	0.00	0	0.10	0.00
Total No. of Taxa	0.67	2.33	3.33	1.67	8.00	10.30	8.00
Annelida No. Taxa	0.67	1.00	2.00	0.33	5.00	5.60	5.00
Arthropoda No. Taxa	0.00	0.00	0.00	0.33	1.67	2.40	1.33
Mollusca No. Taxa	0.00	0.00	0.00	0.00	0.33	1.10	0.33
Miscellaneous No. Taxa	0.00	1.33	1.33	1.00	1.00	1.10	1.33
Ectoprocta Abundance	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insecta Abundance <sup>†</sup>	0.00	0.00	0.00	0.00	0	0.10	0.00

\* Mean of ten replicate samples. All others are mean of triplicate samples.

\*\* Transects overlap in the subtidal, so the -8 foot MLLW station on transect HMB4 was eliminated.

† Insecta is a Class within Arthropoda, however distinction was made between these Taxa for the fish gut content analysis and was therefore considered relevant here.

Note: Abundance of individual replicate samples are found in Appendix B, Table B-1.

**Table 3.** Five most abundant species for Half Moon Bay stations.

Station	HMB 2 +4			Pooled	Mean	St. Dev.				
Rep	A	B	C							
Nemertea Indet.	10	7	5	22	7.33	2.517				
<i>Saccocirrus</i> sp.	3	1	2	6	2.00	1.0				
Opheliidae Indet.	2	0	1	3	1.00	1.0				
Polychaeta Indet.	1	1	1	3	1.00	0.0				
Harpacticoida Indet.	1	1	0	2	0.67	0.577				

Station	HMB 2 +0										Pooled	Mean	St. Dev.
Rep	A	B	C	D	E	F	G	H	I	J			
Nemertea Indet.	21	1	28	25	0	24	10	3	12	4	128	12.8	11.084
Harpacticoida Indet.	12	0	0	23	0	26	2	0	5	4	72	7.2	10.308
Bivalvia Indet.	1	0	0	10	0	6	2	0	0	1	20	2	3.551
<i>Harpacticus</i> sp.	3	0	0	7	0	8	0	0	1	0	19	1.9	3.270
<i>Glycinde armigera</i>	2	0	0	4	0	0	1	1	0	1	9	0.9	1.302

Station	HMB 3 +8			Pooled	Mean	St. Dev.				
Rep	A	B	C							
Nemertea Indet.	22	12	2	36	12.00	10.0				
Oligochaeta Indet.	0	0	17	17	5.67	9.815				
Chironomidae	1	0	0	1	0.33	0.577				
Cirripedia Indet.	0	1	0	1	0.33	0.577				

**Table 3. Five most abundant species for Half Moon Bay stations (continued).**

Station	HMB 3 +4			Pooled	Mean	St. Dev.
Rep	A	B	C			
Nemertea Indet.	47	46	26	119	39.67	11.846
Opheliidae Indet.	1	0	4	5	1.67	2.082
Polychaeta Indet.	1	0	0	1	0.33	0.577

Station	HMB 3 +0			Pooled	Mean	St. Dev.
Rep	A	B	C			
Nemertea Indet.	21	14	12	47	15.67	4.726
<i>Nephtys californiensis</i>	0	3	1	4	1.33	1.528
<i>Eohaustorius</i>						
<i>washingtonianus</i>	1	0	2	3	1.00	1.0
Glycinde armigera	1	0	1	2	0.67	0.577
Polychaeta Indet.	0	1	0	1	0.33	0.577

Station	HMB 3 -4			Pooled	Mean	St. Dev.
Rep	A	B	C			
Opheliidae Indet.	11	6	13	30	10.00	3.606
Nemertea Indet.	7	10	12	29	9.67	2.517
Harpacticoida Indet.	5	9	2	16	5.33	3.512
Bivalvia Indet.	3	1	2	6	2.00	1.0
<i>Mediomastus</i> sp.	2	1	0	3	1.00	1.0

Station	HMB 3 -8			Pooled	Mean	St. Dev.
Rep	A	B	C			
Nemertea Indet.	9	25	19	53	17.67	8.083
<i>Saccocirrus</i> sp.	7	1	23	31	10.33	11.372
Opheliidae Indet.	5	1	11	17	5.67	5.033
<i>Spio butleri</i>	5	4	3	12	4.00	1.000
Harpacticoida Indet.	0	2	7	9	3.00	3.606

Station	HMB 3 -12			Pooled	Mean	St. Dev.
Rep	A	B	C			
<i>Saccocirrus</i> sp.	254	96	93	443	147.67	92.100
Nemertea Indet.	8	10	8	26	8.67	1.155
<i>Mandibulophoxus mayi</i>	4	3	1	8	2.67	1.528
<i>Pacifoculodes spinipes</i>	2	0	0	2	0.67	1.155
Opheliidae Indet.	1	1	2	4	1.33	0.577

Station	HMB 4 +12			Pooled	Mean	St. Dev.
Rep	A	B	C			
Nemertea Indet.	0	2	0	2	0.67	1.155
Oligochaeta Indet.	1	0	0	1	0.33	0.577
<i>Microphthalmus</i> sp.	0	1	0	1	0.33	0.577

**Table 3.** Five most abundant species for Half Moon Bay stations (continued).

Station	HMB 4+8										Pooled	Mean	St. Dev.
Rep	A	B	C	D	E	F	G	H	I	J			
Nemertea Indet.	1	5	0	2	3	3	3	7	6	6	36	3.6	2.261
Oligochaeta Indet.	1	2	8	2	1	3	4	6	4	0	31	3.1	2.5
Station	HMB 4 +4			Pooled	Mean	St. Dev.							
Rep	A	B	C										
Nemertea Indet.	8	11	8	27	9.00	1.732							
Oligochaeta Indet.	3	8	3	14	4.67	2.887							
<i>Euzonus</i> sp. 1	1	1	2	4	1.33	0.577							
Opheliidae Indet.	2	0	0	2	0.67	1.155							
Polychaeta Indet.	0	1	0	1	0.33	0.577							
Station	HMB 4 +0			Pooled	Mean	St. Dev.							
Rep	A	B	C										
Nemertea Indet.	6	5	9	18	6.00	1.0							
Oligochaeta Indet.	8	2	6	16	5.33	3.055							
Opheliidae Indet.	0	0	2	2	0.67	1.155							
<i>Eteone columbiensis</i>	0	1	0	1	0.33	0.577							
<i>Spio butleri</i>	0	0	1	1	0.33	0.577							

**Table 3. Five most abundant species for Half Moon Bay stations (continued).**

Station	HMB 4 -4			Pooled	Mean	St. Dev.
Rep	A	B	C			
Harpacticoida Indet.	40	1	36	77	25.67	21.455
<i>Harpacticus</i> sp.	11	39	6	56	18.67	17.786
<i>Saccocirrus</i> sp.	20	20	10	50	16.67	5.774
Opheliidae Indet.	14	7	14	35	11.67	4.041
Bivalvia Indet.	18	9	5	32	10.67	6.658

Station	HMB 4 -12			Pooled	Mean	St. Dev.
Rep	A	B	C			
<i>Saccocirrus</i> sp.	183	81	497	761	253.67	216.816
Nemertea Indet.	47	11	26	84	28.00	18.083
<i>Spio butleri</i>	1	1	2	4	1.33	0.577
<i>Chaetozone bansei</i>	0	2	0	2	0.67	1.155
Polychaeta Indet.	0	0	2	2	0.67	1.155

Station	HMB 5 +12			Pooled	Mean	St. Dev.
Rep	A	B	C			
Oligochaeta Indet.	1	0	0	1	0.33	0.577
<i>Spio butleri</i>	0	1	0	1	0.33	0.577

Station	HMB 5 +8			Pooled	Mean	St. Dev.
Rep	A	B	C			
Nemertea Indet.	13	15	5	33	11.00	5.292
Oligochaeta Indet.	1	3	5	9	3.00	2.0

Station	HMB 5 +4			Pooled	Mean	St. Dev.
Rep	A	B	C			
Nemertea Indet.	4	9	9	22	7.33	2.887
Opheliidae Indet.	3	0	0	3	1.00	1.732
Oligochaeta Indet.	3	0	0	3	1.00	1.732
<i>Euzonus</i> sp. 1	1	1	1	3	1.00	0.0
<i>Tetrastemma</i> sp.	0	1	0	1	0.33	0.577

Station	HMB 5 +0			Pooled	Mean	St. Dev.
Rep	A	B	C			
Nemertea Indet.	6	10	32	48	16.00	14.000
Opheliidae Indet.	0	1	0	1	0.33	0.577
Harpacticoida Indet.	0	0	1	1	0.33	0.577

**Table 3.** Five most abundant species for Half Moon Bay stations (continued).

Station	HMB 5 -4			Pooled	Mean	St. Dev.
Rep	A	B	C			
Nemertea Indet.	9	24	23	50	16.67	7.506
<i>Saccocirrus</i> sp.	9	15	5	29	9.67	5.033
Opheliidae Indet.	9	2	7	18	6.00	3.606
Harpacticoida Indet.	4	8	2	14	4.67	3.055
<i>Nephtys californiensis</i>	5	4	0	9	3.00	2.646

Station	HMB 5 -8										Pooled	Mean	St. Dev.
Rep	A	B	C	D	E	F	G	H	I	J			
Nemertea Indet.	4	3	16	19	9	12	6	17	17	18	121	12.1	5.788
Harpacticoida Indet.	9	11	6	19	0	0	15	4	13	31	108	10.8	10
Opheliidae Indet.	0	8	5	13	5	17	8	2	13	9	80	8	4.729
<i>Saccocirrus</i> sp.	1	8	1	0	0	1	0	5	11	10	37	3.7	4.583
Bivalvia Indet.	1	5	2	2	1	4	2	0	14	2	33	3.3	4.187

Station	HMB 5 -12			Pooled	Mean	St. Dev.
Rep	A	B	C			
<i>Saccocirrus</i> sp.	223	103	249	575	191.67	77.880
Nemertea Indet.	44	39	107	190	63.33	37.899
Harpacticoida Indet.	0	3	4	7	2.33	2.082
<i>Marionina</i> sp.	2	2	2	6	2.00	0.0
Opheliidae Indet.	1	4	1	6	2.00	1.732

dominant at one station each (HMB3 -4 and HMB4 -4, respectively). At station HMB5 +12 only two organisms were detected, Oligochaeta indet. and *Spio butleri* (Table 3).

Biomass measurements in Half Moon Bay were relatively low at all stations due to the small sample size, low abundance, and dominance of small juvenile organisms, (Table 4). Subtidal stations had a higher mean total biomass (0.020 grams per sample) than the intertidal stations (0.003 grams per sample), which correlates with greater abundance subtidally. Subtidal station HMB4 -12 had the greatest mean total biomass of all Half Moon Bay stations (0.039 grams per sample), while station HMB3 -8 had the second highest mean total biomass (0.038 grams per sample). At station HMB4 -12, mean biomass was dominated by molluscs (0.022 grams per sample), while station HMB3 -8 mean biomass was dominated by polychaetes (0.036 grams per sample) (Table 4).

### **3.1.2 Juvenile Size Class**

Mean abundance and number of taxa measured for juvenile organisms at stations sampled in Half Moon Bay are summarized in Table 5. Juvenile organisms, in general, dominate the benthic infauna, comprising 86.7% of the total abundance measurements in Half Moon Bay. The station with the highest total abundance of juvenile organisms observed was HMB4 -12, with 285.3 individuals, with abundance dominated by the annelid *Saccocirrus sp.* Highest mean total number of taxa for juveniles was observed at station HMB4 -4, with a mean of 10.7 taxa.

Table 6 shows the percentage of juvenile organisms averaged by station and transect for the abundance and richness endpoints from the June 2004 survey. Although variability was high, the percentage of juveniles generally increased with depth. The lowest average percentage of juveniles was found at stations along the +12 feet MLLW elevation (23.6 percent) and the highest percentage was observed along the -12 feet MLLW elevation (83.2 percent). The percentage of juveniles across all stations ranged from 0.0 percent (no juveniles) at station HMB5 +12 to a high of 86.8 percent at station HMB4 -12. In the intertidal, the abundance and number of taxa of the miscellaneous phyla consistently contained the highest percentage of juvenile organisms. In the subtidal zone, the percentage of juveniles from the phyla Mollusca and Annelida increased to levels slightly higher than seen in the miscellaneous phyla.

### **3.1.3 Adult Size Class**

Mean abundance and number of taxa measured for adult organisms at stations sampled in Half Moon Bay are summarized in Table 7. Adult organisms were observed at very low abundances in the 1.0 mm and 0.5 mm size fractions, and at subtidal stations in the 0.25 mm size fraction. At the intertidal stations, mean total abundance was 4.1 adults per sample compared to 13.41 adults per sample at the subtidal stations. The highest abundance was measured in the subtidal at -4 feet MLLW, largely attributed to the elevated number of adult organisms observed at HMB4 -4 (57.0 adults observed) (Table 7). The station with the second most abundant adult organisms observed was HMB5 -8 with a mean total abundance of 14.5 adults. The crustacean Harpacticoida indet. was the most abundant adult species at both stations.

**Table 4. Biomass summary data for Half Moon Bay stations.**

Station	HMB 2 +4		
	Pooled	Mean	St. Dev.
Miscellaneous weight (gm)	0.0024	0.0008	0.000529
Mollusca weight (gm)	0	0	0
Crustacea weight (gm)	0.0002	0.00007	0.00006
Polychaeta weight (gm)	0.0052	0.001733	0.002223
Total Biomass (gm)	0.0078	0.0026	

Station	HMB 2 +0		
	Pooled	Mean	St. Dev.
Miscellaneous weight (gm)	0.0289	0.00289	0.0048411
Mollusca weight (gm)	0.0015	0.00015	0.000165
Crustacea weight (gm)	0.0087	0.00087	0.0010791
Polychaeta weight (gm)	0.0192	0.00192	0.002337
Total Biomass (gm)	0.0583	0.00583	

Station	HMB 3 +8		
	Pooled	Mean	St. Dev.
Miscellaneous weight (gm)	0.003	0.001	0.0009644
Mollusca weight (gm)	0	0	0
Crustacea weight (gm)	0.0001	0.00003	0.00006
Polychaeta weight (gm)	0	0	0
Total Biomass (gm)	0.0031	0.00103	

Station	HMB 3 +4		
	Pooled	Mean	St. Dev.
Miscellaneous weight (gm)	0.0044	0.0014667	0.0004933
Mollusca weight (gm)	0	0	0
Crustacea weight (gm)	0	0	0
Polychaeta weight (gm)	0.0021	0.0007	0.0009644
Total Biomass (gm)	0.0065	0.00217	

Station	HMB 3 +0		
	Pooled	Mean	St. Dev.
Miscellaneous weight (gm)	0.0015	0.0005	0.0002
Mollusca weight (gm)	0	0	0
Crustacea weight (gm)	0.0023	0.0007667	0.0007095
Polychaeta weight (gm)	0.0105	0.0035	0.0037
Total Biomass (gm)	0.0143	0.004767	

Station	HMB 3 -4		
	Pooled	Mean	St. Dev.
Miscellaneous weight (gm)	0.0026	0.0008667	0.0004726
Mollusca weight (gm)	0.0007	0.0002333	0.00006
Crustacea weight (gm)	0.0007	0.0002333	0.0001155
Polychaeta weight (gm)	0.0752	0.0250667	0.0263337
Total Biomass (gm)	0.0792	0.0264	

Station	HMB 3 -8		
	Pooled	Mean	St. Dev.
Miscellaneous weight (gm)	0.0031	0.0010333	0.0001528
Mollusca weight (gm)	0.0004	0.0001333	0.0001528
Crustacea weight (gm)	0.0007	0.0002333	0.0002309
Polychaeta weight (gm)	0.1082	0.0360667	0.0365467
Total Biomass (gm)	0.1124	0.037467	

Station	HMB 3 -12		
	Pooled	Mean	St. Dev.
Miscellaneous weight (gm)	0.0012	0.0004	0
Mollusca weight (gm)	0.0005	0.0001667	0.0002082
Crustacea weight (gm)	0.0074	0.0024667	0.0020207
Polychaeta weight (gm)	0.0119	0.0039667	0.0018877
Total Biomass (gm)	0.021	0.007	

Note: Weights include adults and juveniles. Biomass data for individual replicate samples are found in Appendix B, Table B-2.

**Table 4. Biomass summary data for Half Moon Bay stations (continued).**

Station	HMB 4 +12		
	Pooled	Mean	St. Dev.
Miscellaneous weight (gm)	0.0003	0.0001	0.0001
Mollusca weight (gm)	0	0	0
Crustacea weight (gm)	0	0	0
Polychaeta weight (gm)	0.0003	0.0001	0.0001732
Total Biomass (gm)	0.0006	0.0002	

Station	HMB 4 +8		
	Pooled	Mean	St. Dev.
Miscellaneous weight (gm)	0.0055	0.00055	0.0002677
Mollusca weight (gm)	0	0	0
Crustacea weight (gm)	0	0	0
Polychaeta weight (gm)	0	0	0
Total Biomass (gm)	0.0055	0.00055	

Station	HMB 4 +4		
	Pooled	Mean	St. Dev.
Miscellaneous weight (gm)	0.0034	0.0011333	0.0005859
Mollusca weight (gm)	0	0	0
Crustacea weight (gm)	0	0	0
Polychaeta weight (gm)	0.0446	0.0148667	0.0104987
Total Biomass (gm)	0.048	0.016	

Station	HMB 4 +0		
	Pooled	Mean	St. Dev.
Miscellaneous weight (gm)	0.0027	0.0009	0.000171
Mollusca weight (gm)	0	0	0
Crustacea weight (gm)	0	0	0
Polychaeta weight (gm)	0.001	0.0003333	0.0003055
Total Biomass (gm)	0.0034	0.00113	

Note: Weights include adults and juveniles. Biomass data for individual replicate samples are found in Appendix B, Table B-2.

Station	HMB 4 -4		
	Pooled	Mean	St. Dev.
Miscellaneous weight (gm)	0.0006	0.0002	0.0001
Mollusca weight (gm)	0.0035	0.0012	0.0009
Crustacea weight (gm)	0.0067	0.0022	0.0004
Polychaeta weight (gm)	0.0154	0.0051	0.0028
Total Biomass (gm)	0.0262	0.00873	

Station	HMB 4 -12		
	Pooled	Mean	St. Dev.
Mollusca weight (gm)	0.0661	0.0220333	0.0198525
Miscellaneous weight (gm)	0.0043	0.0014333	0.0006506
Crustacea weight (gm)	0.0017	0.0005667	0.0006429
Polychaeta weight (gm)	0.0444	0.0148	0.0069907
Total Biomass (gm)	0.1165	0.03883	

Station	HMB 5 +12		
	Pooled	Mean	St. Dev.
Miscellaneous weight (gm)	0.0002	0.00007	0.0001155
Mollusca weight (gm)	0	0	0
Crustacea weight (gm)	0	0	0
Polychaeta weight (gm)	0.0002	0.00007	0.0001155
Total Biomass (gm)	0.0004	0.00014	

Station	HMB 5 +8		
	Pooled	Mean	St. Dev.
Miscellaneous weight (gm)	0.0026	0.0008667	0.0002517
Mollusca weight (gm)	0	0	0
Crustacea weight (gm)	0	0	0
Polychaeta weight (gm)	0	0	0
Total Biomass (gm)	0.0026	0.00087	

**Table 4. Biomass summary data for Half Moon Bay stations (continued).**

Station	HMB 5 +4		
	Pooled	Mean	St. Dev.
Miscellaneous weight (gm)	0.0016	0.0005333	0.0001155
Mollusca weight (gm)	0	0	0
Crustacea weight (gm)	0	0	0
Polychaeta weight (gm)	0.0104	0.0034667	0.005054
Total Biomass (gm)	0.012	0.004	

Station	HMB 5 +0		
	Pooled	Mean	St. Dev.
Miscellaneous weight (gm)	0.0015	0.0005	0.0005568
Mollusca weight (gm)	0	0	0
Crustacea weight (gm)	0.0001	0.00003	0.00006
Polychaeta weight (gm)	0.0003	0.0001	0.0001732
Total Biomass (gm)	0.0019	0.00063	

Station	HMB 5 -4		
	Pooled	Mean	St. Dev.
Miscellaneous weight (gm)	0.0039	0.0013	0.000619
Mollusca weight (gm)	0.0002	0.00007	0.0001155
Crustacea weight (gm)	0.0022	0.0007333	0.0006506
Polychaeta weight (gm)	0.0237	0.0079	0.0057193
Total Biomass (gm)	0.0295	0.00983	

Station	HMB 5 -8		
	Pooled	Mean	St. Dev.
Miscellaneous weight (gm)	0.05	0.005	0.0132948
Mollusca weight (gm)	0.0056	0.00056	0.0006096
Crustacea weight (gm)	0.0166	0.00166	0.0019173
Polychaeta weight (gm)	0.1117	0.01117	0.0118394
Total Biomass (gm)	0.1839	0.01839	

Note: Weights include adults and juveniles. Biomass data for individual replicate samples are found in Appendix B, Table B-2.

**Table 5. Half Moon Bay mean abundance and taxa – Juveniles only.**

Station	HMB2 +4	HMB2 +0*
Total Abundance	10.7	21.9
Annelida Abundance	4.0	3.9
Arthropoda Abundance	0.0	2.6
Mollusca Abundance	0.0	2.1
Miscellaneous Abundance	6.7	12.8
Ectoprocta Abundance	0.0	0.1
Insecta Abundance <sup>†</sup>	0.0	0.4
 Total Number of Taxa	4.0	6.5
Annelida No. of Taxa	3.0	2.7
Arthropoda No. Of Taxa	0.0	1.7
Mollusca No. of Taxa	0.0	0.6
Miscellaneous No. of Taxa	1.0	1.2
Ectoprocta No. of Taxa	0.0	0.1
Insecta No. of Taxa <sup>†</sup>	0.0	0.2

Station	HMB3 +8	HMB3 +4	HMB3+0	HMB3 -4	HMB3 -8	HMB3 -12
Total Abundance	12.7	33.7	18.7	28.7	37.3	161.7
Annelida Abundance	0.3	1.7	2.7	17.3	19.0	150.0
Arthropoda Abundance	0.3	0.0	0.3	0.0	0.0	1.7
Mollusca Abundance	0.0	0.0	0.0	2.0	1.3	1.3
Miscellaneous Abundance	12.0	32.0	15.7	9.3	17.0	8.7
Ectoprocta Abundance	0.0	0.0	0.0	-	-	-
Insecta Abundance <sup>†</sup>	0.0	0.0	0.0	0.0	0.0	0.0
 Total Number of Taxa	1.7	1.7	3.3	6.0	5.3	6.0
Annelida No. of Taxa	0.3	0.7	2.0	4.0	3.3	3.0
Arthropoda No. Of Taxa	0.3	0.0	0.3	0.0	0.0	1.3
Mollusca No. of Taxa	0.0	0.0	0.0	1.0	1.0	0.7
Miscellaneous No. of Taxa	1.0	1.0	1.0	1.0	1.0	1.0
Ectoprocta No. of Taxa	0.0	0.0	0.0	-	-	-
Insecta No. of Taxa <sup>†</sup>	0.0	0.0	0.0	0.0	0.0	0.0

**Table 5. Half Moon Bay mean abundance and taxa – Juveniles only (continued).**

Station	HMB4 +12	HMB4 +8*	HMB4 +4	HMB4 +0	HMB4 -4	HMB4 -12	
Total Abundance	0.7	3.6	9.3	6.3	47.7	285.3	
Annelida Abundance	0.0	0.0	1.0	1.0	23.3	255.3	
Arthropoda Abundance	0.0	0.0	0.0	0.0	11.0	0.7	
Mollusca Abundance	0.0	0.0	0.0	0.0	10.7	1.3	
Miscellaneous Abundance	0.7	3.6	8.3	5.3	2.7	28.0	
Ectoprocta Abundance	0.0	0.0	0.0	0.0	-	-	
Insecta Abundance <sup>†</sup>	0.0	0.0	0.0	0.0	0.0	0.0	
Total Number of Taxa	0.3	0.9	1.7	1.7	10.7	5.7	
Annelida No. of Taxa	0.0	0.0	0.7	0.7	4.7	2.7	
Arthropoda No. Of Taxa	0.0	0.0	0.0	0.0	4.0	0.7	
Mollusca No. of Taxa	0.0	0.0	0.0	0.0	1.0	1.3	
Miscellaneous No. of Taxa	0.3	0.9	1.0	1.0	1.0	1.0	
Ectoprocta No. of Taxa	0.0	0.0	0.0	0.0	-	-	
Insecta No. of Taxa <sup>†</sup>	0.0	0.0	0.0	0.0	0.0	0.0	
Station	HMB5 +12	HMB5 +8	HMB5 +4	HMB5 +0	HMB5 -4	HMB5 -8*	HMB5 -12
Total Abundance	0.0	10.7	8.3	16.3	35.0	33.6	261.7
Annelida Abundance	0.0	0.0	1.0	0.3	18.3	16.5	197.3
Arthropoda Abundance	0.0	0.0	0.0	0.0	0.0	1.7	0.0
Mollusca Abundance	0.0	0.0	0.0	0.0	1.0	3.4	0.7
Miscellaneous Abundance	0.0	10.7	7.3	16.0	17.7	11.9	63.7
Ectoprocta Abundance	0.0	0.0	0.0	0.0	-	-	-
Insecta Abundance <sup>†</sup>	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Total Number of Taxa	0.0	1.0	2.0	1.3	5.3	7.4	6.3
Annelida No. of Taxa	0.0	0.0	1.0	0.3	4.0	4.3	4.7
Arthropoda No. Of Taxa	0.0	0.0	0.0	0.0	0.0	0.8	0.0
Mollusca No. of Taxa	0.0	0.0	0.0	0.0	0.3	1.1	0.3
Miscellaneous No. of Taxa	0.0	1.0	1.0	1.0	1.0	1.1	1.3
Ectoprocta No. of Taxa	0.0	0.0	0.0	0.0	-	-	-
Insecta No. of Taxa <sup>†</sup>	0.0	0.0	0.0	0.0	0.0	0.1	0.0

\* Mean of ten replicate samples. All others are mean of triplicate samples.

† Insecta is a Class within Arthropoda, however distinction was made between these Taxa for the fish gut content analysis and was therefore considered relevant here.

Note: Abundance of individual replicate samples are found in Appendix B, Table B-1.

**Table 6. Percentage of major taxa abundance and richness represented by juveniles at Half Moon Bay stations.**

<b>Station</b>	<b>HMB4+12</b>	<b>HMB5+12</b>	<b>Average Percent</b>
Total Abundance	50.0	0.0	25.0
Annelida Abundance	0.0	0.0	0.0
Arthropoda Abundance	0.0	0.0	0.0
Mollusca Abundance	0.0	0.0	0.0
Miscellaneous Abundance	100.0	0.0	50.0
Total Number of Taxa	33.3	0.0	16.7
Annelida No. of Taxa	0.0	0.0	0.0
Arthropoda No. Of Taxa	0.0	0.0	0.0
Mollusca No. of Taxa	0.0	0.0	0.0
Miscellaneous No. of Taxa	100.0	0.0	50.0
<b>Average by Station/Transect</b>	<b>47.2</b>	<b>0.0</b>	<b>23.6</b>

<b>Station</b>	<b>HMB3+8</b>	<b>HMB4+8</b>	<b>HMB5+8</b>	<b>Average Percent</b>
Total Abundance	69.1	53.7	76.2	66.3
Annelida Abundance	5.9	0.0	0.0	2.0
Arthropoda Abundance	100.0	0.0	0.0	33.3
Mollusca Abundance	0.0	0.0	0.0	0.0
Miscellaneous Abundance	100.0	100.0	97.0	99.0
Total Number of Taxa	71.4	50.0	42.9	54.8
Annelida No. of Taxa	50.0	0.0	0.0	16.7
Arthropoda No. Of Taxa	100.0	0.0	0.0	33.3
Mollusca No. of Taxa	0.0	0.0	0.0	0.0
Miscellaneous No. of Taxa	100.0	100.0	75.0	91.7
<b>Average by Station/Transect</b>	<b>74.6</b>	<b>38.0</b>	<b>36.4</b>	<b>49.6</b>

<b>Station</b>	<b>HMB2+4</b>	<b>HMB3+4</b>	<b>HMB4+4</b>	<b>HMB5+4</b>	<b>Average Percent</b>
Total Abundance	74.4	80.8	58.3	78.1	72.9
Annelida Abundance	66.7	83.3	14.3	33.3	49.4
Arthropoda Abundance	0.0	0.0	0.0	0.0	0.0
Mollusca Abundance	0.0	0.0	0.0	0.0	0.0
Miscellaneous Abundance	87.0	80.7	92.6	95.7	89.0
Total Number of Taxa	60.0	71.4	35.7	60.0	56.8
Annelida No. of Taxa	69.2	66.7	22.2	50.0	52.0
Arthropoda No. Of Taxa	0.0	0.0	0.0	0.0	0.0
Mollusca No. of Taxa	0.0	0.0	0.0	0.0	0.0
Miscellaneous No. of Taxa	60.0	75.0	60.0	75.0	67.5
<b>Average by Station/Transect</b>	<b>69.6</b>	<b>76.3</b>	<b>47.2</b>	<b>65.4</b>	<b>64.6</b>

**Table 7. Half Moon Bay mean abundance and taxa – Adults only.**

Station	HMB2 +4	HMB2 +0*				
Total Abundance	3.7	12.2				
Annelida Abundance	2.0	0.6				
Arthropoda Abundance	0.7	9.7				
Mollusca Abundance	0.0	0.0				
Miscellaneous Abundance	1.0	1.4				
Ectoprocta Abundance	0.0	0.5				
Insecta Abundance <sup>†</sup>	0.0	0.0				
 Total Number of Taxa	2.7	3.9				
Annelida No. of Taxa	1.3	0.6				
Arthropoda No. Of Taxa	0.7	1.6				
Mollusca No. of Taxa	0.0	0.0				
Miscellaneous No. of Taxa	0.7	1.3				
Ectoprocta No. of Taxa	0.0	0.4				
Insecta No. of Taxa <sup>†</sup>	0.0	0.0				
Station	HMB3 +8	HMB3 +4	HMB3+0	HMB3 -4	HMB3 -8	HMB3 -12
Total Abundance	5.7	8.0	0.7	7.7	10.0	2.7
Annelida Abundance	5.3	0.3	0.0	2.0	4.7	0.3
Arthropoda Abundance	0.0	0.0	0.7	5.3	4.7	2.3
Mollusca Abundance	0.0	0.0	0.0	0.0	0.0	0.0
Miscellaneous Abundance	0.0	7.7	0.0	0.3	0.7	0.0
Ectoprocta Abundance	0.0	0.0	0.0	-	-	-
Insecta Abundance <sup>†</sup>	0.3	0.0	0.0	0.0	0.0	0.0
 Total Number of Taxa	0.7	0.7	0.7	2.7	5.0	1.7
Annelida No. of Taxa	0.3	0.3	0.0	1.3	3.0	0.3
Arthropoda No. Of Taxa	0.0	0.0	0.7	1.0	1.3	1.3
Mollusca No. of Taxa	0.0	0.0	0.0	0.0	0.0	0.0
Miscellaneous No. of Taxa	0.0	0.3	0.0	0.3	0.7	0.0
Ectoprocta No. of Taxa	0.0	0.0	0.0	-	-	-
Insecta No. of Taxa <sup>†</sup>	0.3	0.0	0.0	0.0	0.0	0.0
Station	HMB4 +12	HMB4 +8*	HMB4 +4	HMB4 +0	HMB4 -4	HMB4 -12
Total Abundance	0.7	3.1	6.7	6.3	57.0	2.0
Annelida Abundance	0.7	3.1	6.0	5.7	10.7	1.7
Arthropoda Abundance	0.0	0.0	0.0	0.0	46.0	0.3
Mollusca Abundance	0.0	0.0	0.0	0.0	0.3	0.0
Miscellaneous Abundance	0.0	0.0	0.7	1.3	0.0	0.0
Ectoprocta Abundance	0.0	0.0	0.0	0.0	-	-
Insecta Abundance <sup>†</sup>	0.0	0.0	0.0	0.0	0.0	0.0
 Total Number of Taxa	0.7	0.9	3.0	1.7	5.3	2.0
Annelida No. of Taxa	0.7	0.9	2.3	1.3	1.0	1.7
Arthropoda No. Of Taxa	0.0	0.0	0.0	0.0	4.0	0.3
Mollusca No. of Taxa	0.0	0.0	0.0	0.0	0.3	0.0
Miscellaneous No. of Taxa	0.0	0.0	0.7	0.3	0.0	0.0
Ectoprocta No. of Taxa	0.0	0.0	0.0	0.0	-	-
Insecta No. of Taxa <sup>†</sup>	0.0	0.0	0.0	0.0	0.0	0.0

**Table 7. Half Moon Bay mean abundance and taxa – Adults only (continued).**

Station	HMB5 +12	HMB5 +8	HMB5 +4	HMB5 +0	HMB5 -4	HMB5 -8*	HMB5 -12
Total Abundance	0.7	3.3	2.3	0.3	9.7	14.5	3.7
Annelida Abundance	0.7	3.0	2.0	0.0	3.3	3.3	0.7
Arthropoda Abundance	0.0	0.0	0.0	0.3	5.3	10.8	3.0
Mollusca Abundance	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Miscellaneous Abundance	0.0	0.3	0.3	0.0	1.0	0.3	0.0
Ectoprocta Abundance	0.0	0.0	0.0	0.0	-	-	-
Insecta Abundance <sup>†</sup>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Number of Taxa	0.7	1.3	1.3	0.3	4.0	4.1	2.0
Annelida No. of Taxa	0.7	1.0	1.0	0.0	1.3	1.9	0.7
Arthropoda No. Of Taxa	0.0	0.0	0.0	0.3	1.7	1.9	1.3
Mollusca No. of Taxa	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Miscellaneous No. of Taxa	0.0	0.3	0.3	0.0	1.0	0.2	0.0
Ectoprocta No. of Taxa	0.0	0.0	0.0	0.0	-	-	-
Insecta No. of Taxa <sup>†</sup>	0.0	0.0	0.0	0.0	0.0	0.0	0.0

\* Mean of ten replicate samples. All others are mean of triplicate samples.

† Insecta is a Class within Arthropoda, however distinction was made between these Taxa for the fish gut content analysis and was therefore considered relevant here.

Note: Abundance of individual replicate samples are found in Appendix B, Table B-1.

### **3.1.4 Sediment Grain Size**

Sediment grain size for Half Moon Bay samples are summarized in Table 8. All stations in Half Moon Bay consisted almost entirely of sands and gravels. Percent fines ranged from a high of 2.4% at station HMB2 +0, to 0.1% fines at stations HMB3 +8 and HMB4 +12. Subtidal stations in Half Moon Bay averaged 95.8% sand, ranging from a high of 99.2% at stations HMB3 -12 and HMB5 -12 to a low of 75.5% at HMB4 -4. Intertidal stations were also predominantly sand, although six of thirteen stations were composed of 5% gravel or more. The three stations with the highest percent gravel for all Half Moon Bay stations were all along transect HMB4; HMB4 -4 (23.2%), HMB4 +0 (17.2%) and HMB4 +4 (15.9%).

## **3.2 South Beach Benthic Infauna**

Benthic infauna samples were collected at 8 intertidal stations (+12 to 0 feet MLLW) along South Beach (see Figure 1). Triplicate samples were analyzed at each station. Total mean abundance was somewhat greater at South Beach (all intertidal stations) than at the intertidal stations in Half Moon Bay. Mean total number of taxa between the two locations was comparable however. Summary tables in the following sections are organized into three categories: 1) pooled adult and juvenile data, 2) only juvenile data, and 3) only adult data.

### **3.2.1 Pooled Adult and Juvenile**

Mean abundance and number of taxa (pooled to include both adult and juvenile organisms) for South Beach intertidal stations are summarized in Table 9. A general pattern of increasing abundance is present with decreasing elevation, with the exception of the +8 feet MLLW elevation. The abundance at SB1 +8 (90.7 individuals) and SB2 +8 (76.7 individuals) were greater than the +12 or the +4 feet MLLW elevations. The highest mean total abundance was observed at SB1 +0 (162.0 individuals). The lowest two intertidal stations (+0 feet MLLW) represented 52.4% of all South Beach observations, averaging 132.5 individuals per sample. The lowest abundance was observed at the highest intertidal station (+12 feet MLLW), averaging 3.0 individuals (Table 9).

The ribbon worm (*Nemertea* indet.) represented 83% of all individuals observed. In fact, *Nemertea* indet. was the dominant organism at 6 of the 8 South Beach stations, with the exception of station SB1 +12, where Trichopteran larvae represented 2 of the 4 individuals observed, and SB2 +12 where annelids (*Oligochaeta* indet.) were the dominant organisms (Table 10). Although the miscellaneous phyla was the dominant taxa group at all stations, the abundance of arthropods along the +8 feet MLLW elevation (SB1 +8 with 20.7 individuals; SB2 +8 with 24.3 individuals) was much greater than at any stations in either South Beach or Half Moon Bay.

Total number of taxa ranged from 1.33 at station SB1 +12 to 5.33 at station SB2 +0. With the exception of the stations along the +8 feet MLLW elevation, the number of taxa of annelids was slightly higher than the other taxa groups. The taxa at stations SB1 +8 and SB2 +8 were more evenly distributed, with a greater mean number of arthropods and miscellaneous phyla present.

**Table 8.** Sediment grain size results.**HALF MOON BAY**

Station	HMB2 +4	HMB2 +0					
% gravel	2.8	3.7					
% sand	96.5	93.9					
% fines	0.7	2.4					
Station	HMB3 +8	HMB3 +4	HMB3+0	HMB3 -4	HMB3 -8	HMB3 -12	
% gravel	0	8.1	1.7	0.4	0.5	0	
% sand	99.9	90.5	97.5	98.8	96.7	99.2	
% fines	0.1	1.4	0.8	0.8	0.8	0.8	
Station	HMB4 +12	HMB4 +8	HMB4 +4	HMB4 +0	HMB4 -4	HMB4 -12	
% gravel	0	9.9	15.9	17.2	23.2	0	
% sand	99.9	89.9	83.4	82.6	75.5	99.1	
% fines	0.1	0.2	0.7	0.2	1.3	0.9	
Station	HMB5 +12	HMB5 +8	HMB5 +4	HMB5 +0	HMB5 -4	HMB5 -8	HMB5 -12
% gravel	0.5	0	15	8.7	0	0	0
% sand	99.3	99.7	84.6	90.9	99.1	98.9	99.2
% fines	0.2	0.3	0.4	0.4	0.9	1.1	0.8

**SOUTH BEACH**

Station	SB1 +12	SB1 +8	SB1 +4	SB1 +0
% gravel	0	0	0	0.1
% sand	99.9	99.3	99.3	99.1
% fines	0.1	0.7	0.7	0.8
Station	SB2 +12	SB2 +8	SB2 +4	SB2 +0
% gravel	0	0	0	0.2
% sand	100	99.2	99.3	99
% fines	0	0.8	0.7	0.8

**Table 9. South Beach mean abundance and taxa – Combined adults and juveniles.**

<b>Station</b>	<b>SB1 +12</b>	<b>SB1 +8</b>	<b>SB1 +4</b>	<b>SB1 +0</b>
Total Abundance	1.33	90.67	42.67	162.00
Annelida Abundance	0.33	2.00	2.67	13.33
Arthropoda Abundance	0.00	20.67	0.33	0.33
Miscellaneous Abundance	0.33	68.00	39.67	148.00
Insecta Abundance	0.67	0.00	0.00	0.33
Total No. of Taxa	1.33	3.67	3.00	3.67
Annelida No. of Taxa	0.33	1.33	1.67	1.33
Arthropoda No. of Taxa	0.00	1.33	0.33	0.33
Miscellaneous No. of Taxa	0.33	1.00	1.00	1.67
Insecta No. of Taxa	0.67	0.00	0.00	0.33
<b>Station</b>	<b>SB2 +12</b>	<b>SB2 +8</b>	<b>SB2 +4</b>	<b>SB2 +0</b>
Total Abundance	4.67	76.67	24.33	103.00
Annelida Abundance	4.00	7.67	4.67	4.33
Arthropoda Abundance	0.00	24.33	1.33	1.00
Miscellaneous Abundance	0.33	44.67	18.33	97.67
Insecta Abundance	0.33	0.00	0.00	0.00
Total No. of Taxa	2.00	4.33	5.00	5.33
Annelida No. of Taxa	1.33	2.33	2.67	2.67
Arthropoda No. of Taxa	0.00	1.00	1.33	1.00
Miscellaneous No. of Taxa	0.33	1.00	1.00	1.67
Insecta No. of Taxa	0.33	0.00	0.00	0.00

Note: Abundance of individual replicate samples are found in Appendix B, Table B-1.

**Table 10. Most abundant species for South Beach stations.**

Station	SB 1 +12			Pooled	Mean	St. Dev.
Rep	A	B	C			
Trichoptera larvae	0	1	1	2	0.67	0.5774
Nemertea Indet.	1	0	0	1	0.33	0.5774
Oligochaeta Indet.	1	0	0	1	0.33	0.5774

Station	SB 1 +8			Pooled	Mean	St. Dev.
Rep	A	B	C			
Nemertea Indet.	73	65	66	204	68.00	4.3589
<i>Eohaustorius brevicuspis</i>	22	23	16	61	20.33	3.7859
<i>Spiro butleri</i>	0	3	1	4	1.33	1.5275
<i>Euzonus</i> sp.	1	0	0	1	0.33	0.5774
Gammaridea Indet.	0	1	0	1	0.33	0.5774

Station	SB 1 +4			Pooled	Mean	St. Dev.
Rep	A	B	C			
Nemertea Indet.	70	48	1	119	39.67	35.2467
<i>Nephtys californiensis</i>	2	2	1	5	1.67	0.5774
<i>Spiro butleri</i>	0	2	0	2	0.67	1.1547
Opheliidae Indet.	1	0	0	1	0.33	0.5774
<i>Eohaustorius brevicuspis</i>	0	0	1	1	0.33	0.5774

Station	SB 1 +0			Pooled	Mean	St. Dev.
Rep	B	C	F			
Nemertea Indet.	150	112	176	438	146.00	32.1870
Opheliidae Indet.	0	8	29	37	12.33	14.9778
Platyhelminthes Indet.	0	2	4	6	2.00	2.0000
<i>Nephtys californiensis</i>	0	2	1	3	1.00	1.0000
Trichoptera larvae	1	0	0	1	0.33	0.5774

**Table 10. Most abundant species for South Beach stations (continued).**

Station	SB 2 +12			Pooled	Mean	St. Dev.
Rep	A	B	C			
Oligochaeta Indet.	1	3	7	11	3.67	3.0551
<i>Spio butleri</i>	1	0	0	1	0.33	0.5774
Nemertea Indet.	0	1	0	1	0.33	0.5774
Trichoptera larvae	0	1	0	1	0.33	0.5774
<i>Eohaustorius brevicuspis</i>	0	0	0	0	0.00	0.0000

Station	SB 2 +8			Pooled	Mean	St. Dev.
Rep	B	C	D			
Nemertea Indet.	68	26	40	134	44.67	21.3854
<i>Eohaustorius brevicuspis</i>	31	15	27	73	24.33	8.3267
<i>Spio butleri</i>	3	3	6	12	4.00	1.7321
<i>Euzonus</i> sp.	0	0	6	6	2.00	3.4641
Oligochaeta Indet.	0	0	2	2	0.67	1.1547

Station	SB 2 +4			Pooled	Mean	St. Dev.
Rep	A	B	C			
Nemertea Indet.	8	24	23	55	18.33	8.9629
<i>Spio butleri</i>	1	1	5	7	2.33	2.3094
<i>Nephrys californiensis</i>	3	1	1	5	1.67	1.1547
<i>Eohaustorius brevicuspis</i>	1	1	1	3	1.00	0.0000
Polychaeta Indet.	1	0	0	1	0.33	0.5774

Station	SB 2 +0			Pooled	Mean	St. Dev.
Rep	A	B	C			
Nemertea Indet.	84	106	97	287	95.67	11.0604
Platyhelminthes Indet.	3	0	3	6	2.00	1.7321
<i>Microphthalmus</i> sp.	0	4	0	4	1.33	2.3094
<i>Saccocirrus</i> sp.	2	0	0	2	0.67	1.1547
<i>Spio butleri</i>	0	2	0	2	0.67	1.1547

South Beach biomass measurements are relatively high compared to biomass measurements in Half Moon Bay (Table 11). South Beach (all intertidal stations) had a mean total biomass of 0.038 gm/per sample, compared to 0.006 gm/per sample for intertidal stations in Half Moon Bay. South Beach stations had a higher proportion of adult organisms in the 1.0 mm and 0.5 mm size classes than occurred at HMB intertidal stations. However, this was due to the abundance of adult *Eohaustorius brevicuspis* at the +8 feet MLLW tidal height. Station SB2 +8 had the highest mean total biomass (0.214 grams per sample) of all South Beach stations, followed by SB1 +4 (0.031 grams per sample), due to the presence of large numbers of juvenile Nemertea at these stations.

### **3.2.2 Juvenile Size Class**

Mean abundance and number of taxa measured for juvenile organisms at stations sampled in South Beach are summarized in Table 12. Juvenile organisms comprised 87.5% of the mean total abundance measurements. The juvenile distribution pattern seen at Half Moon Bay stations was also found at the South Beach stations (Table 13). The percent abundance and numbers of taxa of juvenile organisms generally increased from the high to the low intertidal zone, with no juveniles found at the +12 feet MLLW elevation and an overall average of 69.1 percent at the 0 feet MLLW elevation. Along the +8 feet MLLW elevation, 68.7 percent of the abundance and 67.1 percent of the numbers of taxa were represented by juveniles. A similar pattern was seen at stations along the +4 feet elevation stations where 84.8 percent of the total abundance and 48.9 percent of the taxa were juvenile organisms. The total abundance along the 0 feet elevation was composed of 97.9 percent juveniles and 71.2 percent of the total numbers of taxa were found to be juvenile organisms.

### **3.2.3 Adult Size Class**

Mean abundance and number of taxa measured for adult organisms at stations sampled in South Beach are summarized in Table 14. Adult organisms were mainly observed at low abundance levels in the 1.0 mm and 0.5 mm size fractions, but at slightly higher numbers than at Half Moon Bay. Mean total abundance was 8.7 adults per sample at South Beach, compared to 4.1 adults per sample in Half Moon Bay intertidal samples.

Total abundance for adults in South Beach was highest at the middle upper intertidal (+8 feet MLLW). Total abundance at +8 feet MLLW had a mean of 25.5 adults per sample (representing 73.2% of all South Beach individuals), versus a mean total abundance of 3.1 adults at all other stations. The dominant adult species observed at this elevation was the amphipod *Eohaustorius brevicuspis*.

### **3.2.4 Sediment Grain Size**

Sediment grain size in South Beach was very uniform at all stations and elevations, consisting of over 99% sand and less than 1% fines (Table 8).

**Table 11. Biomass summary data for South Beach stations.**

Station				SB1 +12		
	Pooled	Mean	St. Dev.			
Miscellaneous weight (gm)	0.0014	0.0004667	0.0003786			
Mollusca weight (gm)	0	0	0			
Crustacea weight (gm)	0	0	0			
Polychaeta weight (gm)	0	0	0			
Total Biomass (gm)	0.0014	0.0004667				

Station				SB 1 +8		
	Pooled	Mean	St. Dev.			
Miscellaneous weight (gm)	0.0082	0.0027333	0.0012858			
Mollusca weight (gm)	0	0	0			
Crustacea weight (gm)	0.0828	0.0276	0.0050269			
Polychaeta weight (gm)	0.0021	0.0007	0.0006928			
Total Biomass (gm)	0.0931	0.031033				

Station				SB 1 +4		
	Pooled	Mean	St. Dev.			
Miscellaneous weight (gm)	0.0147	0.0049	0.0048539			
Mollusca weight (gm)	0	0	0			
Crustacea weight (gm)	0.0007	0.0002333	0.0004041			
Polychaeta weight (gm)	0.0787	0.0262333	0.0392941			
Total Biomass (gm)	0.0941	0.031367				

Station				SB 1 +0		
	Pooled	Mean	St. Dev.			
Miscellaneous weight (gm)	0.013	0.0043333	0.0009018			
Mollusca weight (gm)	0	0	0			
Crustacea weight (gm)	0.0019	0.0006333	0.001097			
Polychaeta weight (gm)	0.0063	0.0021	0.0018358			
Total Biomass (gm)	0.0212	0.00707				

Note: Weights include adults and juveniles. Biomass data for individual replicate samples are found in Appendix B, Table B-2.

Station				SB2 +12		
	Pooled	Mean	St. Dev.			
Miscellaneous weight (gm)	0.0014	0.0004667	0.0003215			
Mollusca weight (gm)	0	0	0			
Crustacea weight (gm)	0	0	0			
Polychaeta weight (gm)	0.001	0.0003333	0.0005774			
Total Biomass (gm)	0.0024	0.0008				

Station				SB 2 +8		
	Pooled	Mean	St. Dev.			
Miscellaneous weight (gm)	0.0066	0.0022	0.001179			
Mollusca weight (gm)	0	0	0			
Crustacea weight (gm)	0.0805	0.0268333	0.0105983			
Polychaeta weight (gm)	0.5539	0.1846333	0.3182356			
Total Biomass (gm)	0.641	0.213667				

Station				SB 2 +4		
	Pooled	Mean	St. Dev.			
Miscellaneous weight (gm)	0.0072	0.0024	0.0027875			
Mollusca weight (gm)	0	0	0			
Crustacea weight (gm)	0.0184	0.0061333	0.0003786			
Polychaeta weight (gm)	0.0116	0.0038667	0.0015177			
Total Biomass (gm)	0.0372	0.0124				

Station				SB 2 +0		
	Pooled	Mean	St. Dev.			
Miscellaneous weight (gm)	0.004	0.0013333	0.001159			
Mollusca weight (gm)	0	0	0			
Crustacea weight (gm)	0.0024	0.0008	0.0008544			
Polychaeta weight (gm)	0.0052	0.0017333	0.0019218			
Total Biomass (gm)	0.0116	0.003867				

**Table 12. South Beach mean abundance and taxa – Juveniles only.**

<b>Station</b>	<b>SB1 +12</b>	<b>SB1 +8</b>	<b>SB1 +4</b>	<b>SB1 +0</b>
Total Abundance	0.7	71.0	39.7	159.3
Annelida Abundance	0.0	1.3	0.7	12.7
Arthropoda Abundance	0.0	2.0	0.0	0.0
Miscellaneous Abundance	0.0	67.7	39.0	146.3
Insecta Abundance	0.7	0.0	0.0	0.3
 Total Number of Taxa	 0.7	 2.7	 1.3	 3.0
Annelida No. of Taxa	0.0	0.7	0.7	1.0
Arthropoda No. of Taxa	0.0	1.0	0.0	0.0
Miscellaneous No. of Taxa	0.0	1.0	0.7	1.7
Insecta No. of Taxa	0.7	0.0	0.0	0.3
 <b>Station</b>	 <b>SB2 +12</b>	 <b>SB2 +8</b>	 <b>SB2 +4</b>	 <b>SB2 +0</b>
Total Abundance	0.3	45.3	18.7	100.7
Annelida Abundance	0.0	2.3	2.3	3.0
Arthropoda Abundance	0.0	2.3	0.3	0.3
Miscellaneous Abundance	0.0	40.7	16.0	97.3
Insecta Abundance	0.3	0.0	0.0	0.0
 Total Number of Taxa	 0.3	 2.7	 2.7	 3.7
Annelida No. of Taxa	0.0	1.0	1.3	1.7
Arthropoda No. of Taxa	0.0	0.7	0.3	0.3
Miscellaneous No. of Taxa	0.0	1.0	1.0	1.7
Insecta No. of Taxa	0.3	0.0	0.0	0.0

Note: Abundance of individual replicate samples are found in Appendix B, Table B-1.

**Table 13. Percentage of major taxa abundance and richness represented by juveniles at South Beach stations.**

<b>Station</b>	<b>SB1+12</b>	<b>SB2+12</b>	<b>Average Percent</b>
Total Abundance	0.0	0.0	0.0
Annelida Abundance	0.0	0.0	0.0
Arthropoda Abundance	0.0	0.0	0.0
Mollusca Abundance	0.0	0.0	0.0
Miscellaneous Abundance	0.0	0.0	0.0
Total Number of Taxa	0.0	0.0	0.0
Annelida No. of Taxa	0.0	0.0	0.0
Arthropoda No. of Taxa	0.0	0.0	0.0
Mollusca No. of Taxa	0.0	0.0	0.0
Miscellaneous No. of Taxa	0.0	0.0	0.0
<b>Average by Station/Transect</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
<b>Station</b>	<b>SB1+8</b>	<b>SB2+8</b>	<b>Average Percent</b>
Total Abundance	78.3	59.1	68.7
Annelida Abundance	66.7	30.4	48.6
Arthropoda Abundance	9.7	9.6	9.6
Mollusca Abundance	0.0	0.0	0.0
Miscellaneous Abundance	99.5	91.0	95.3
Total Number of Taxa	72.7	61.5	67.1
Annelida No. of Taxa	50.0	42.9	46.4
Arthropoda No. of Taxa	75.0	66.7	70.8
Mollusca No. of Taxa	0.0	0.0	0.0
Miscellaneous No. of Taxa	100.0	100.0	100.0
<b>Average by Station/Transect</b>	<b>69.0</b>	<b>57.7</b>	<b>63.3</b>
<b>Station</b>	<b>SB1+4</b>	<b>SB2+4</b>	<b>Average Percent</b>
Total Abundance	93.0	76.7	84.8
Annelida Abundance	25.0	50.0	37.5
Arthropoda Abundance	0.0	25.0	12.5
Mollusca Abundance	0.0	0.0	0.0
Miscellaneous Abundance	98.3	87.3	92.8
Total Number of Taxa	44.4	53.3	48.9
Annelida No. of Taxa	40.0	50.0	45.0
Arthropoda No. of Taxa	0.0	25.0	12.5
Mollusca No. of Taxa	0.0	0.0	0.0
Miscellaneous No. of Taxa	66.7	100.0	83.3
<b>Average by Station/Transect</b>	<b>45.9</b>	<b>58.4</b>	<b>52.2</b>

**Table 14. South Beach mean abundance and taxa – Adults only.**

<b>Station</b>	<b>SB1 +12</b>	<b>SB1 +8</b>	<b>SB1 +4</b>	<b>SB1 +0</b>
Total Abundance	0.7	19.7	3.0	2.7
Annelida Abundance	0.3	0.7	2.0	0.7
Arthropoda Abundance	0.0	18.7	0.3	0.3
Miscellaneous Abundance	0.3	0.3	0.7	1.7
Insecta Abundance	0.0	0.0	0.0	0.0
 Total Number of Taxa	0.7	2.3	2.3	2.0
Annelida No. of Taxa	0.3	0.7	1.3	0.7
Arthropoda No. of Taxa	0.0	1.3	0.3	0.3
Miscellaneous No. of Taxa	0.3	0.3	0.7	1.0
Insecta No. of Taxa	0.0	0.0	0.0	0.0
 <b>Station</b>	<b>SB2 +12</b>	<b>SB2 +8</b>	<b>SB2 +4</b>	<b>SB2 +0</b>
Total Abundance	4.3	31.3	5.7	2.3
Annelida Abundance	4.0	5.3	2.3	1.3
Arthropoda Abundance	0.0	22.0	1.0	0.7
Miscellaneous Abundance	0.3	4.0	2.3	0.3
Insecta Abundance	0.0	0.0	0.0	0.0
 Total Number of Taxa	1.7	4.0	4.0	2.0
Annelida No. of Taxa	1.3	2.0	2.0	1.0
Arthropoda No. of Taxa	0.0	1.0	1.0	0.7
Miscellaneous No. of Taxa	0.3	1.0	1.0	0.3
Insecta No. of Taxa	0.0	0.0	0.0	0.0

Note: Abundance of individual replicate samples are found in Appendix B, Table B-1.

### **3.3 Summary of Distribution Patterns**

#### **3.3.1 Half Moon Bay**

- Highest abundance and number of taxa were found at subtidal stations (-4 to -12 feet MLLW). Station HMB4 -12 had the greatest mean total abundance at 287.3 individuals per sample, while station HMB4 -4 had the greatest mean total number of taxa at 16.0.
- Subtidal stations had a mean total abundance of 125.0 individuals per sample and a mean of 9.6 for total number of taxa. Intertidal stations had a mean of 15.9 individuals per sample and a mean 3.4 for total number of taxa.
- The intertidal stations of the two transects located in the inner bay protected by the jetty generally had higher abundance than the intertidal stations of the two transects located further to the east. For subtidal stations, mean total abundance was greatest along transect HMB4 at 196 individuals per sample. For all stations along transect HMB4, a mean total abundance of 102.6 individuals was observed, whereas transects HMB3 and HMB5 had mean total abundances of 54.6 and 65.3 individuals, respectively.
- The ribbon worm (*Nemertea* indet.) was the dominant organism at 15 of 21 stations station within Half Moon Bay. The polychaete *Saccocirrus* dominated the three -12 foot MLLW stations and was observed at abundances 17 times greater than the most abundant *Nemertea* indet. observation.
- Juvenile organisms in the 0.25 mm size class dominated abundance measurements in Half Moon Bay due to the large concentrations of *Saccocirrus* sp. at the -12 foot MLLW stations. A small number of adult organisms were found, primarily in the 1.0 mm and 0.5 mm size classes.
- Subtidal stations had a higher mean total biomass (0.020 grams per sample) than the intertidal stations (0.003 grams per sample). Biomass was dominated by polychaetes, particularly in subtidal stations.

#### **3.3.2 South Beach**

- Intertidal stations in South Beach were similar in mean total taxa to the Half Moon Bay intertidal stations (3.5 to 3.4 taxa per sample, respectively). However, intertidal stations in South Beach had a much greater mean total abundance than the Half Moon Bay intertidal stations (63.2 to 15.9 individuals per sample, respectively).
- Total abundance varied by elevation at the South Beach intertidal. The lower intertidal (+0 feet MLLW) had higher mean abundance (132.5 individuals per sample) than the middle (58.6 individuals per sample) and lower intertidal (3.0 individuals per sample).
- Mean total abundance ranged from 1.3 individuals per sample at station SB1 +12 to 162.0 individuals per sample at station SB1 +0. Total number of taxa ranged from 1.3 at station SB1 +12 to 5.33 at station SB2 +0.

- Similar to Half Moon Bay, the ribbon worm (*Nemertea* indet.) was the dominant organism at all South Beach stations, with the exception of SB1 +12, where Trichopteran larvae were dominant, and SB2 +12, where the annelid *Oligochaeta* indet. was dominant.
- Compared to Half Moon Bay, South Beach has a slightly higher proportion of adult organisms present in the 1.0 mm and 0.5 m size classes, which resulted in higher biomass. Station SB1 +0 had the highest mean total biomass of 0.05 grams per sample.

### **3.4 Comparisons between January and June Sampling Periods**

Three methods were used to compare benthic community data between the January and June sampling periods. The first method was the Pierson correlation analysis comparing three measures of sediment grain size to the benthic community endpoints. The second method was the Kruskal-Wallis one-way analysis of variance. This nonparametric test rank orders the data and determines whether the center points of each population differ from the others. When there are only two groups (i.e., one degree of freedom) as in the case of the January and June sampling periods, the procedure in the Systat software calculates the Mann-Whitney U test and reports those results. The third method combines a description of the dominant taxa and a subjective comparison between the two sampling periods.

#### ***3.4.1 Pierson Correlation Analysis***

Pierson's correlation analysis was conducted to determine the relationship between the benthic community endpoints and three measures of sediment grain size: percent gravel, sand and fines. The data were also examined to determine if the placement of material at the South Jetty changed that relationship between these factors post-placement. Table 15 shows the results of this analysis. The table is arranged to show correlation coefficients by transect water depth and displays the January and June sampling periods side by side. A coefficient of +0.7000 was used as the level at which a relationship was deemed to be significant.

The number of significant correlations between grain size and benthic endpoints was low at the high intertidal stations (+4, +8, and +12 feet MLLW). At the +12 feet elevation during the January sampling period, three of the ten endpoints appeared to be correlated with percent fines; in June one of the ten endpoints was correlated to percent sand. At the +8 feet elevation in January, one endpoint was related to percent gravel while in June, six endpoints were correlated to percent fines. Percent gravel was related to three endpoints in January at the +4 feet elevation and no relationships were found during the June period.

A higher number of significant relationships were found at the low intertidal and subtidal stations. At the +0 feet elevation, a majority of the endpoints were correlated to percent fine in both the January and June sampling periods. At the -4 feet elevation in January, two endpoints were related to percent gravel, two to percent sand, and three to percent fines; in June, seven of the ten endpoints were related to percent fines and one endpoint to percent sand. Since the survey grid has only two stations along the -8 feet elevation, the calculated correlation coefficients by the Systat software resulted in either a +1.000 or a -1.000. A majority of the endpoints were related to percent gravel for both the January and June surveys (Table 15). A similar trend was seen in January at the -12 feet elevation with five of the endpoints correlated to percent gravel and two correlated to percent sand. In June there was no gravel present at stations along the -12 feet elevation, where three of the endpoints were related to percent sand and none to percent fines.

A comparison of the total number of positive correlations between the January and June sampling periods are summarized in Table 16 and shows that the benthic infauna in January was predominantly correlated to percent gravel and in June to percent fines.

**Table 15. Pierson correlation coefficients comparing the benthic infaunal endpoints to three components of sediment grain size.**

Depth (feet MLLW)	+12					
Sampling Period	January			June		
Grain Size	Gravel	Sand	Fines	Gravel	Sand	Fines
Total Abundance	.	-0.8901	0.8901	-0.8165	0.7651	-0.5000
Miscellaneous Abundance	.	-0.9141	0.9141	-0.5222	0.4078	0.0000
Mollusc Abundance	.	.	.	.	.	.
Arthropoda Abundance	.	-0.3169	0.3169	.	.	.
Annelida Abundance	.	-0.7690	0.7690	-0.3333	0.4685	-0.8165
Total Number of Taxa	.	-0.4854	0.4854	-0.5774	0.6312	-0.7071
Miscellaneous No. of Taxa	.	.	.	-0.5774	0.4508	0.0000
Mollusc No. of Taxa	.	.	.	.	.	.
Arthropoda No. of Taxa	.	-0.3169	0.3169	.	.	.
Annelida No. of Taxa	.	-0.6288	0.6288	-0.3333	0.4685	-0.8165

Depth (feet MLLW)	+8					
Sampling Period	January			June		
Grain Size	Gravel	Sand	Fines	Gravel	Sand	Fines
Total Abundance	0.5312	-0.5337	-0.3810	-0.5317	0.4775	0.9443
Miscellaneous Abundance	0.9729	-0.9739	-0.8884	-0.5837	0.5332	0.9127
Mollusc Abundance	.	.	.	.	.	.
Arthropoda Abundance	-0.3094	0.3075	0.3995	-0.3988	0.3393	0.9691
Annelida Abundance	-0.4082	0.4058	0.5270	-0.1021	0.0476	0.7914
Total Number of Taxa	-0.4082	0.4058	0.5270	-0.1336	0.0693	0.9402
Miscellaneous No. of Taxa	.	.	.	.	.	.
Mollusc No. of Taxa	.	.	.	.	.	.
Arthropoda No. of Taxa	-0.4082	0.4058	0.5270	-0.4082	0.3492	0.9672
Annelida No. of Taxa	-0.4082	0.4058	0.5270	0.2500	-0.2980	0.5744

Depth	+4					
Sampling Period	January			June		
Grain Size	Gravel	Sand	Fines	Gravel	Sand	Fines
Total Abundance	0.8475	-0.8551	-0.3386	-0.4597	0.4411	0.4518
Miscellaneous Abundance	0.8439	-0.8517	-0.3317	-0.4394	0.4194	0.4810
Mollusc Abundance	.	.	.	.	.	.
Arthropoda Abundance	-0.0416	0.0519	-0.3770	-0.5979	0.6082	-0.1552
Annelida Abundance	0.8026	-0.8110	-0.2775	0.3383	-0.3025	-0.8116
Total Number of Taxa	0.1084	-0.1093	-0.0431	-0.3687	0.3965	-0.5574
Miscellaneous No. of Taxa	.	.	.	-0.2830	0.2891	-0.0982
Mollusc No. of Taxa	.	.	.	.	.	.
Arthropoda No. of Taxa	-0.0416	0.0519	-0.3770	-0.5979	0.6082	-0.1552
Annelida No. of Taxa	0.1881	-0.1992	0.2962	-0.0418	0.0654	-0.5058

Notes:

Shaded cells represent correlation coefficients with a +0.7000 or greater.

Each table is arranged by water depth and shows the January and June sampling periods side by side. Data from each station at a water depth were pooled to conduct the analysis.

**Table 15. Pierson correlation coefficients comparing the benthic infaunal endpoints to three components of sediment grain size (continued).**

Depth	+0					
	January			June		
Sampling Period	Gravel	Sand	Fines	Gravel	Sand	Fines
Grain Size						
Total Abundance	-0.7586	0.7606	0.2975	-0.6473	0.6645	0.1364
Miscellaneous Abundance	-0.4182	0.4719	-0.3684	-0.6378	0.6713	0.0000
Mollusc Abundance	-0.0209	-0.0572	0.7997	-0.1153	0.0013	0.9455
Arthropoda Abundance	-0.5274	0.4549	0.9557	-0.1585	0.0450	0.9589
Annelida Abundance	-0.5054	0.4324	0.9517	0.6040	-0.6567	0.2307
Total Number of Taxa	-0.5412	0.4935	0.7102	-0.3456	0.2425	0.9547
Miscellaneous No. of Taxa	.	.	.	-0.3858	0.3175	0.6977
Mollusc No. of Taxa	0.1842	-0.2406	0.4933	-0.1153	0.0013	0.9455
Arthropoda No. of Taxa	-0.6195	0.5683	0.7786	-0.3425	0.2400	0.9466
Annelida No. of Taxa	-0.5862	0.5646	0.4648	-0.1603	0.0622	0.8546

Depth	-4					
	January			June		
Sampling Period	Gravel	Sand	Fines	Gravel	Sand	Fines
Grain Size						
Total Abundance	-0.9790	0.9992	-0.2662	-0.9961	-0.9964	0.9932
Miscellaneous Abundance	-0.8421	0.9482	-0.5921	-0.9742	0.9733	-0.9078
Mollusc Abundance	0.8322	-0.6719	-0.5000	-0.9913	-0.9907	0.9436
Arthropoda Abundance	0.0640	-0.3054	1.0000	-0.9999	-0.9999	0.9820
Annelida Abundance	-0.2662	0.0231	0.9449	-0.8895	-0.8913	0.9639
Total Number of Taxa	0.0640	-0.3054	1.0000	-0.9999	-0.9999	0.9820
Miscellaneous No. of Taxa	.	.	.	0.4869	-0.4904	0.6547
Mollusc No. of Taxa	0.8322	-0.6719	-0.5000	-0.8735	-0.8715	0.7559
Arthropoda No. of Taxa	0.0640	-0.3054	1.0000	-0.9891	-0.9897	0.9983
Annelida No. of Taxa	-0.9979	0.9522	0.0000	-0.8584	0.8604	-0.9449

Depth	-8					
	January			June		
Sampling Period	Gravel	Sand	Fines	Gravel	Sand	Fines
Grain Size						
Total Abundance	1.0000	-1.0000	-1.0000	1.0000	-1.0000	-1.0000
Miscellaneous Abundance	1.0000	-1.0000	-1.0000	1.0000	-1.0000	-1.0000
Mollusc Abundance	1.0000	-1.0000	-1.0000	-1.0000	1.0000	1.0000
Arthropoda Abundance	-1.0000	1.0000	1.0000	-1.0000	1.0000	1.0000
Annelida Abundance	1.0000	-1.0000	-1.0000	1.0000	-1.0000	-1.0000
Total Number of Taxa	1.0000	-1.0000	-1.0000	1.0000	-1.0000	-1.0000
Miscellaneous No. of Taxa	.	.	.	.	.	.
Mollusc No. of Taxa	1.0000	-1.0000	-1.0000	-1.0000	1.0000	1.0000
Arthropoda No. of Taxa	.	.	.	.	.	.
Annelida No. of Taxa	.	.	.	1.0000	-1.0000	-1.0000

Notes:

Shaded cells represent correlation coefficients with a +0.7000 or greater.

Each table is arranged by water depth and shows the January and June sampling periods side by side.

Data from each station at a water depth were pooled to conduct the analysis.

**Table 15.** Pierson correlation coefficients comparing the benthic infaunal endpoints to three components of sediment grain size (continued).

Depth	-12					
Sampling Period	January			June		
Grain Size	Gravel	Sand	Gravel	Gravel	Sand	Fines
Total Abundance	0.9804	-0.9305	-0.2402	.	0.9961	-0.9961
Miscellaneous Abundance	0.9990	-0.9912	0.0000	.	-0.5587	0.5587
Mollusc Abundance	.	.	.	.	0.0000	0.0000
Arthropoda Abundance	-0.8874	0.7924	0.5000	.	0.3812	-0.3812
Annelida Abundance	0.9483	-0.8776	-0.3592	.	0.9263	-0.9263
Total Number of Taxa	0.8874	-0.7924	-0.5000	.	0.8660	-0.8660
Miscellaneous No. of Taxa	.	.	.	.	.	.
Mollusc No. of Taxa	.	.	.	.	-0.5000	0.5000
Arthropoda No. of Taxa	-0.8874	0.7924	0.5000	.	0.1890	-0.1890
Annelida No. of Taxa	0.8874	-0.7924	-0.5000	.	0.5000	-0.5000

Notes:

Shaded cells represent correlation coefficients with a +0.7000 or greater.

Each table is arranged by water depth and shows the January and June sampling periods side by side.

Data from each station at a water depth were pooled to conduct the analysis.

**Table 16.** Summary of positive correlations between grain size and the January and June surveys.

Grain Size	January	June
% Gravel	17	5
% Sand	6	8
% Fines	9	22

### **3.4.2 Kruskal-Wallis Analysis of Variance**

The summarized results from the Kruskal-Wallis one way analysis of variance are presented in Table 17 and presented in detailed in Appendix E. The analysis calculated 15 benthic community endpoints at 29 stations and compared the results from samples collected in January 2004 to those collected in June 2004. A total of 435 tests were conducted and the results were summarized by the number of stations and by the number of endpoints that showed no significant difference (NS), endpoint data where the abundance and numbers of taxa in June were significantly greater than ( $\alpha=0.05$ ) in January (S+), and endpoint data that showed samples collected in June were significantly less than ( $\alpha=0.05$ ) those sampled in January (S-). An examination of Table 17 shows that of the 435 tests conducted, 320 showed no significant difference between the January and June sampling periods. In 85 cases, the abundance and numbers of taxa were found to be significantly greater in June than in January and in 30 cases, the abundance and numbers of taxa were found to be significantly less in June than in January.

In general, the average number of non-significant comparisons was constant from the +12 feet to the 0 feet MLLW elevation, and then decreased slightly at the subtidal stations. The number of stations where the June data showed significant enhancements over January was lowest at intertidal stations and greatest in the subtidal zone.

The biomass data indicated that over 77 percent of the comparison showed no significant differences between the two sampling periods. Only two biomass endpoints had more than five stations with significant differences (positive or negative) between seasons: the total biomass with eight stations and miscellaneous phyla biomass with nine stations. The comparisons indicated that the stations were fairly evenly split between one season being enhanced over the other. Of the benthic community endpoints, 72 percent of the comparison showed no significant differences between the two sampling periods. Total abundance, annelid abundance, and the total number of taxa showed significant enhancements in June over the January sampling period. For the total abundance endpoint, 41.3 percent of the stations showed enhancements, 38 percent of the stations had annelid abundances significantly greater in June than in January, and 34.5 percent of the stations showed significant enhancements in the total number of taxa in June over January.

**Table 17. Results of the Kruskal Wallis one way analysis of variance comparing endpoint data from stations sampled in January to those sampled in June 2004.**

Station	Total Biomass	Miscellaneous Biomass	Mollusca Biomass	Arthropoda Biomass	Annelida Biomass	Total Abundance	Miscellaneous Abundance	Mollusca Abundance	Arthropoda Abundance	Annelida Abundance	Total No. of Taxa	Miscellaneous No. Taxa	Mollusca No. Taxa	Arthropoda No. Taxa	Annelida No. Taxa	No Significant Difference		
	S+	S-	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	S+	S-	
HMB4+12	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	15	0	0
HMB5+12	S -	S -	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	13	0	2
SB1+12	S -	NS	NS	S -	NS	S -	S -	NS	S -	S -	S -	NS	NS	S -	NS	7	0	8
SB2+12	S -	S -	NS	NS	NS	S -	S -	NS	NS	NS	NS	NS	NS	NS	NS	11	0	4
HMB3+8	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	15	0	0
HMB4+8	NS	NS	NS	NS	NS	NS	NS	S -	NS	NS	S+	S+	NS	NS	S+	11	3	1
HMB5+8	NS	S+	NS	NS	NS	S+	S+	NS	NS	NS	NS	NS	NS	NS	NS	12	3	0
SB1+8	NS	S+	NS	S+	NS	S+	S+	NS	S+	NS	NS	NS	NS	NS	NS	10	5	0
SB2+8	S+	NS	NS	S+	S+	S+	S+	NS	S+	S+	NS	NS	NS	NS	NS	8	7	0
HMB2+4	NS	NS	NS	NS	NS	NS	NS	NS	NS	S+	S+	NS	NS	S+	NS	12	3	0
HMB3+4	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	15	0	0
HMB4+4	NS	S+	NS	NS	NS	S+	NS	NS	NS	S+	NS	NS	NS	NS	S+	11	4	0
HMB5+4	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	15	0	0
SB1+4	NS	NS	NS	NS	S+	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	14	1	0
SB2+4	S+	NS	NS	S+	S+	NS	NS	NS	S+	S+	NS	NS	NS	S+	NS	9	6	0
HMB2+0	NS	S+	NS	NS	NS	NS	NS	NS	S+	NS	S+	S+	NS	S+	NS	10	5	0
HMB3+0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	15	0	0
HMB4+0	NS	NS	NS	NS	NS	NS	NS	S -	NS	NS	S+	NS	NS	NS	NS	13	1	1
HMB5+0	NS	NS	S -	NS	NS	NS	NS	S -	NS	NS	NS	NS	S -	NS	NS	12	0	3
SB1+0	S -	S+	S -	NS	NS	S+	S+	S -	NS	NS	NS	NS	S -	NS	NS	8	3	4
SB2+0	NS	NS	NS	NS	NS	S+	S+	NS	NS	NS	S+	NS	NS	NS	NS	12	3	0
HMB3 -4	NS	NS	NS	NS	S+	S+	NS	NS	NS	NS	NS	S -	S -	NS	S+	10	3	2
HMB4 -4	NS	S -	S -	NS	NS	S+	NS	S+	S+	S+	S+	NS	S+	S+	S+	5	8	2
HMB5 -4	NS	NS	NS	NS	NS	NS	NS	NS	NS	S+	NS	NS	NS	NS	NS	14	1	0
HMB3 -8	NS	S -	NS	NS	NS	S -	NS	NS	S -	NS	NS	NS	NS	NS	NS	12	0	3
HMB5 -8	NS	NS	S+	S+	NS	S+	NS	S+	S+	S+	NS	S+	S+	S+	5	10	0	
HMB3 -12	S+	NS	NS	NS	NS	S+	NS	NS	S+	S+	NS	NS	NS	NS	NS	11	4	0
HMB4 -12	NS	NS	S+	S+	NS	S+	NS	S+	S+	S+	NS	NS	S+	S+	NS	7	8	0
HMB5 -12	S+	NS	NS	NS	S+	S+	NS	S+	S+	S+	NS	NS	NS	S+	NS	8	7	0
No Significant difference	21	20	24	23	24	14	19	24	22	16	18	27	23	24	21	320		
S +	4	5	2	5	5	12	6	3	6	11	10	1	3	4	8		85	
S -	4	4	3	1	0	3	4	2	1	2	1	1	3	1	0		30	

S+ (green shade) indicates the June data were significantly enhanced ( $\alpha = 0.05$ ) over January data.S - (gray shade) indicates the June data were significantly depressed ( $\alpha = 0.05$ ) from those sampled in January 2004.

NS indicates no significant difference between June and January 2004.

### **3.4.3 Dominant Taxa**

The dominant species at the Half Moon Bay stations can be seen in Table 16. The table is arranged to show the abundance of species along elevation/depth contours with a side-by-side comparison of the abundance for January and June. For simplicity, any species along an elevation/depth contour with a mean abundance less than one individual per station has been removed from the analysis. In addition, any species that occurs at only one station along an elevation/depth contour with an abundance of two or less has been removed from the analysis. A complete list of the dominant taxa for January can be found in Appendix B.

The dominant taxa found throughout the study area in Half Moon Bay was the Nemertea indet. They dominated the infauna at 18 of the 21 stations in Half Moon Bay. The other three stations, all at the -12 feet MLLW elevation, were dominated by the polychaete *Saccocirrus* sp. This species of archiannelid is found living between grains of sand and among algae and is considered to be meiofauna. Although it was the dominant species at stations HMB3 -12, HMB4 -12, and HMB5 -12, it was only found during the June sampling period. During the January sampling period those stations were dominated by nemerteans which were also present in June as the subdominant species. The number of species that could be considered dominant or subdominant increased from the high intertidal to the low subtidal. Along the +12 feet MLLW elevation, only two species were abundant enough to be considered dominant. The first was the ever-present Nemertea indet. and the second was the oligochaete *Marionina* sp. Like the polychaete *Saccocirrus* sp., *Marionina* sp. is considered to be meiofauna and lives interstitially between sand grains in the high intertidal zone. It was only present at station HMB+12 during the January sampling period. Nemerteans and oligochaetes were also the two dominant taxa along the +8 feet MLLW elevation. Five dominant taxa were present along the +4 feet MLLW elevation, including nemerteans, oligochaetes and three taxa of polychaetes.

From the 0 to -12 feet MLLW elevation, the number of dominant and subdominant taxa greatly increased. This number ranged from 8 taxa at the 0 feet elevation to 12 at the -12 feet elevation. Beginning at the 0 feet MLLW elevation, harpacticoid copepods, amphipod crustaceans, and small bivalve Mollusca were present. The larger species of polychaetes were also present along these subtidal elevations. The larger species, which were not considered to be meiofauna, were both tube building and free living forms.

The predominant taxa at the South Beach stations were essentially the same as those in Half Moon Bay (Table 19). The nemerteans strongly dominated all eight stations. In a pattern similar to Half Moon Bay, the subdominant taxa at +12 feet MLLW elevation was the oligochaete group. The subdominant species at Stations SB1 +8 and SB2 +8 was the amphipod *Eohaustorius brevicuspis*. While oligochaetes were present along the +8 feet MLLW elevation, they were only found in abundance at Station SB2 +8 during the June sampling period. A clear subdominant species was not observed at stations SB1 +4 and SB2 +4. The polychaete *Nephtys californiensis* was found at both stations but only during the June sampling period. The amphipod *Eohaustorius washingtonianus* was also found at both stations and with a similar abundance to *Nephtys* but only during the January sampling. Unlike the stations in Half Moon Bay, a greater diversity of dominant and subdominant species is present higher in the intertidal

**Table 18.** Most abundant species for Half Moon Bay stations in January and June 2004.

Taxon	Station HMB4+12				Station HMB5+12			
	January		June		January		June	
	Pooled	Mean	Pooled	Mean	Pooled	Mean	Pooled	Mean
Nemertea Indet.	4	1.3	2	0.7	12.0	4.0		
<i>Marionina</i> sp.					31.0	10.3		

Taxon	Station HMB3+8				Station HMB4+8				Station HMB5+8			
	January		June		January		June		January		June	
	Pooled	Mean	Pooled	Mean	Pooled	Mean	Pooled	Mean	Pooled	Mean	Pooled	Mean
Nemertea Indet.	29	9.7	36	12.0	77.0	7.7	36	3.6	8.0	2.7	33	11.0
Oligochaeta Indet.			17	5.7			31	3.1			9	3.0

Taxon	Station HMB2+4				Station HMB3+4				Station HMB4+4				Station HMB5+4			
	January		June		January		June		January		June		January		June	
	Pooled	Mean	Pooled	Mean	Pooled	Mean	Pooled	Mean	Pooled	Mean	Pooled	Mean	Pooled	Mean	Pooled	Mean
Nemertea Indet.	23	7.7	22	7.3	242.0	80.7	119	39.7	24.0	8.0	27	9.0	25.0	8.3	22	7.3
<i>Saccocirrus</i> sp.			6	2.0												
Opheliidae Indet.			3	1.0	7.0	2.3	5	1.7			2	0.7	4.0	1.3	3	1.0
Oligochaeta Indet.											14	4.7			3	1.0
<i>Euzonus</i> spp.									1.0	0.3	4	1.3	2.0	0.7	3	1.0

**Table 19. Most abundant species for South Beach stations for January and June 2004.**

	Station SB1+12				Station SB2+12			
	January		June		January		June	
Taxon	pooled	mean	pooled	mean	pooled	mean	pooled	mean
Nemertea Indet.	75	25	1	0.3	134	44.7	1	0.3
Oligochaeta Indet.	24	8	1	0.3	16	5.3	11	3.7
<i>Eohaustorius brevicuspis</i>	8	2.7						
<i>Pygospio californica</i>	5	1.7						
	Station SB1+8				Station SB2+8			
	January		June		January		June	
	pooled	mean	pooled	mean	pooled	mean	pooled	mean
Nemertea Indet.	16	5.3	204	68.0	27	9.0	134	44.7
<i>Eohaustorius brevicuspis</i>	18	6.0	61	20.3	17	5.7	73	24.3
<i>Euzonus</i> sp.	1	0.3	1	0.3			6	2.0
<i>Spiophanes butleri</i>			4	1.3			12	4.0
Oligochaeta Indet.							2	0.7
	Station SB1+4				Station SB2+4			
	January		June		January		June	
	pooled	mean	pooled	mean	pooled	mean	pooled	mean
Nemertea Indet.	24	8	119	39.7	19	6.3	55	18.3
<i>Nephtys californiensis</i>			5	1.7			5	1.7
<i>Spiophanes butleri</i>			2	0.7			7	2.3
<i>Eohaustorius brevicuspis</i>			1	0.3			3	1.0
<i>Eohaustorius washingtonianus</i>	5	1.7			4	1.3		
	Station SB1+0				Station SB2+0			
	January		June		January		June	
	pooled	mean	pooled	mean	pooled	mean	pooled	mean
Nemertea Indet.	16	5.3	438	146.0	68	22.7	287	95.7
Platyhelminthes Indet.			6	2.0			6	2.0
Opheliidae Indet.	3	1	37	12.3				
<i>Nephtys californiensis</i>			3	1.0				
<i>Siliqua patula</i>	4	1.3						
<i>Eohaustorius washingtonianus</i>	6	2						
<i>Microphthalmus</i> sp.							4	1.3
<i>Spiophanes butleri</i>							2	0.7
<i>Saccocirrus</i> sp.							2	0.7
<i>Protodrilus flabellifer</i>	5	1.7						

zone at the South Beach stations. A greater number of polychaetes and amphipod crustaceans were present at South Beach in comparison to comparable elevations in Half Moon Bay. Conversely, fewer juvenile molluscs were found to be subdominant at the South Beach stations. The only mollusc identified at South Beach as a dominant was *Siliqua patula* at Station SB1 +0 in January 2004.

### **3.5 Fish Gut Content Analysis**

Concurrent with the June 2004 benthic community sampling, beach seining was conducted by the USACE to provide several fish species for stomach content analysis. The objective was to compare the number and type of organisms in the stomach content to the type and abundance of organisms found in the benthic community surveys. This comparison could help determine the relative importance of Half Moon Bay as a juvenile Chinook salmon feeding area during their outmigration. Other species collected for the stomach content analyses included surf smelt, sandlance, American shad, shiner perch, English sole, speckled sanddab, and sand sole. The beach seine surveys where these fish were captured occurred at two locations; Site 1, located in the western portion of the bay near transect HMB3, and Site 2, located approximately 1,300 feet (~400 m) east of Site 1, near transect HMB5 (Figure 1). A gut content summary has been provided for juvenile Chinook salmon (Table 20); for all other species please refer to Appendix F for a detailed account of the stomach content analysis.

Juvenile Chinook salmon stomach content analyses showed that the most prevalent invertebrates consumed by these fish (Table 20) were not abundant in the benthic community in Half Moon Bay (Table 3). The five most abundant invertebrate organisms found in the juvenile Chinook salmon stomachs for both sites combined were *Jassa* sp., dipterans, chironomids, brachyuran zoea, and *Podon* sp., representing 93% of all invertebrates identified and enumerated (Table 20). Nemerteans, which were the dominant benthic organism at 15 of 21 stations in Half Moon Bay (Table 3), represented less than 1% of the juvenile Chinook salmon gut content. *Jassa* sp. were the dominant organism in salmonid gut content (73%). *Jassa* species are tube dwelling amphipods, and known fouling organisms that inhabit flotsam (e.g. kelp and driftwood), pilings, and boat hulls. As they were not found in the Half Moon Bay benthic community, it is probable that they were consumed by the juvenile salmonids during their outmigration along the docks, pilings, hulls, and rip-rap at Westport, and possibly in the rip-rap habitat at the far west end of Half Moon Bay.

The second and third most abundant of the invertebrate organisms in the salmon stomachs were adult dipterans and chironomids, which were extremely rare in the benthic data, and so were considered a water column food source. The fourth most abundant organisms were brachyuran (crab) zoea. These are vertical migrators and were likely consumed in the water column. The fifth most abundant organisms were marine water fleas (*Podon* sp.). These species are zooplanktonic cladocerans and were also likely consumed in the water column. In addition to the invertebrates identified in the stomach samples, one salmon at Site 2 was found to have 67 vegetation seeds within its stomach, which were likely floaters and consumed at the water surface.

**Table 20. Juvenile Chinook salmon stomach content.**

Chinook Salmon			
Site	1	2	Total
Count	10	10	20
Avg. Fork Length (mm)	83.1	81.6	82.4
Stomach Content Species Counts			
<i>Jassa</i> spp.	327	249	576
Vegetation seeds	0	67	67
Diptera	13	34	47
Chironomidae	42	4	46
Brachyura Zoea	24	21	45
<i>Podon</i> sp.	16	0	16
Caprellidae	8	4	12
Cirripedia legs	0	12	12
<i>Corophium</i> sp.	2	6	8
<i>Paracalliopiella pratti</i>	5	1	6
Calliopidae	2	4	6
Chlorophyta pieces	0	4	4
Idoteidae	2	0	2
Nemertea Indet.	1	1	2
Paguridae	0	2	2
Arachnida	1	0	1
<i>Erichthonius</i> sp.	1	0	1
Calanoida	1	0	1
Ostracoda	1	0	1
Hemiptera	1	0	1
Mytilidae	1	0	1
<i>Synidotea</i> sp.	0	1	1
Total No. Observed	448	410	858

Of the flatfish species, the fish group most likely to prey on benthic organisms, only English sole appeared to have consumed benthic organisms found in the Half Moon Bay benthic analysis. One speckled sanddab was analyzed from each of Sites 1 and 2, both having empty stomachs. Similarly, two sand sole from Site 1 had empty stomachs. A total of five organisms were found in the stomachs of six starry flounders sampled at the two stations: two polychaetes, two bivalves and one *Emerita analoga* (Appendix F). Although each of these is considered a benthic community organism, none of these occurred with any frequency in the benthic community analysis at Half Moon Bay (Table 3).

A total of 10 English sole were sampled, each collected from Site 1. The five most abundant organisms from these 10 fish included: the polychaetes Spionidae, Opheliidae, and *Glycinde armigera*, the gammarid *Pacifoculodes*, and the bivalve *Tellina* sp. (Appendix F). Polychaetes were the most abundant class of organisms collected from English sole stomachs, representing 69% of all prey organisms. The data indicates these flatfish were feeding predominately on juvenile polychaetes (Family Spionidae and Opheliidae). Polychaetes from these families were found primarily at mid to lower intertidal elevations. This suggests that English sole may have been feeding on polychaetes derived from these elevations in Half Moon Bay.

Stomach content analysis for the remaining fish species (herring, shad, surf smelt, and sandlance) was dominated by water column organisms, with very little predation on benthic community organisms. Identifiable organisms were not found in the stomachs of the four shiner perch. The single herring stomach analyzed contained only Cirripedia cypris larvae. Cirripedia (barnacles) generally have free-swimming (water column) nauplii and benthic-settling cyprid larvae. The cyprid larval stage is the final stage as the larvae settle out of the water column and molt into the young sedentary stage. Herring could have either preyed on these organisms as benthic or water column food organisms.

The stomach contents of the three American shad were dominated by copepods (87%), followed in abundance by cladocerans (6%), Cirripedia nauplii (4%), and brachyuran zoea (3%). The eight surf smelt stomachs analyzed were dominated by copepods (69%), cladocerans (13%), unidentified fish eggs (9%), and brachyuran zoea (5%). The four Pacific sandlance stomachs were dominated by copepods (86%), cladocerans (8%), and brachyuran zoea (6%) (Appendix F). The dominance of these organisms, particularly copepods, as prey indicates that these fish were feeding in the water column and not on the Half Moon Bay benthic community.

## **4.0 DISCUSSION**

The discussion is framed to respond to the objectives presented in Section 1.1.

- **Objective 1:** Characterize the benthic community at Half Moon Bay and at South Beach for the June 2004 sampling period.

The benthic infaunal community in Half Moon Bay and South Beach sampled in June 2004 shows two fairly distinct characteristics. The abundance and numbers of taxa in the intertidal zone from the +12 to 0 feet MLLW elevation in Half Moon Bay are very low when compared to similar elevations at South Beach. The low intertidal stations at Half Moon Bay (0 feet elevation) contain the highest abundance and numbers of taxa of all Half Moon Bay intertidal stations, but the average abundance was still 1/3 of that found at South Beach. On the other hand, with the exception of Station HMB2 +0, the total number of taxa and the taxa representing the major taxonomic groups was similar to South Beach. The abundance and taxa richness at the intertidal and subtidal stations increased as water depth increased, with the highest abundance and number of taxa found at the -12 feet elevation. This is the expected result because there should be more organic material in the deeper waters to act as a food source and because the subtidal stations are more isolated from extreme environmental and climatic shifts to which organisms in the intertidal zones are exposed. The second characteristic shared by the benthic communities in both sampling areas is the percentage and distribution of juvenile organisms. At both Half Moon Bay and South Beach stations the percentage of juveniles generally increased with increasing water depth with virtually no juveniles being present at the +12 feet stations. With the exception of stations along the +4 feet elevations there were a greater percentage of juveniles at South Beach than at Half Moon Bay. In both study areas the major taxonomic group that contained the greatest percentage of juvenile organisms was the miscellaneous phyla. The proportion of juveniles in both locations is more than likely the result of the sampling period. The months of May and June are the greatest period for planktonic activity and juvenile recruitment from the water column to the benthos.

- **Objective 2:** Determine whether the benthic community at Half Moon Bay has been substantially altered by the placement of sandy dredged material.

The Pierson correlation analysis appeared to indicate that the benthic communities in Half Moon Bay were highly correlated to percent gravel in January and to percent fines in the June sampling period. This result is to be expected and may not be related to beach fill maintenance. The physical environment at Half Moon Bay can be very dynamic during the January time frame with greater current speeds and higher wave activity. Fine particulate materials would not settle to the sediment surface and thus would not be available for the benthic community as a food source. In contrast, water movements and wave heights would be much less in June. Fine particulate material would settle to the sediment surface and be available as a food source. A dynamic shift in the benthic community was not observed between the two sampling periods based on the numbers and types of species present during both surveys and by the dominant taxa groups.

The Kruskal-Wallis analysis of variance compared the endpoint data from stations sampled in January 2004 to the same stations sampled in June 2004. A total of 435 endpoint comparisons were conducted for Half Moon Bay and South Beach. The majority of comparisons showed no significant difference between the January and June surveys. In Half Moon Bay, 77 percent of the comparisons showed no significant difference between the two sampling periods compared to 66 percent showing no significant difference in South Beach. Enhancement in community endpoints was similar in Half Moon Bay and South Beach, with 21 percent and 19 percent significant enhancement, respectively. Endpoint decreases were higher in South Beach, with 13 percent showing significant decreases versus 4 percent in Half Moon Bay. Based on the benthic endpoint comparison, beach fill maintenance has not substantially altered the benthic community at Half Moon Bay.

The biomass data for both sites indicated that arthropod and annelid biomass was slightly enhanced in June while enhancements in the total, miscellaneous, and mollusc biomass were evenly split between the two periods. The arthropod and annelid biomass results could be attributed to the recruitment and settlement of juveniles to the surrounding environment. The total abundance endpoint identified 41 percent of the stations as enhanced in June, which can be attributed to the abundance of annelids where 38 percent of the stations were identified as enhanced.

- **Objective 3:** Identify the dominant and subdominant species at stations sampled in June 2004 and determine whether these species had changed as a result of the placement of sandy dredged material in Half Moon Bay.

The predominant species at nearly all stations in Half Moon Bay and South Beach was the Nemertean ribbon worm. The majority of the subdominant taxa at both intertidal and subtidal stations were very small organisms that are considered meiofauna. These organisms occur interstitially between sand grains feeding on small pieces of organic material that are trapped there. These species include archiannelids, oligochaetes, and harpacticoid copepods. Juvenile organisms from the phyla Annelida, Arthropoda, and Mollusca made up the remainder of the dominant and subdominant in both sampling areas. The primary difference between Half Moon Bay and South Beach was the diversity of the dominant species. There was a greater number of taxa that could be considered as dominant at the majority of South Beach stations at all but in the high intertidal zone. To identify difference in the seasonal abundance of the dominant taxa the abundance of nemerteans were examined. This species group was present consistently at all stations during both sampling periods. While there did appear to be some trend showing a greater abundance of nemerteans in June, it was not conclusive at either the intertidal or subtidal stations in Half Moon Bay. Conversely it was clear at all but the two +12 feet elevation stations in South Beach.

- **Objective 4:** Assess the relative invertebrate production of these shorelines as related to provision of food organisms for juvenile salmonids, forage fish, juvenile flatfish, and shorebirds.

The stomach content of fish present in Half Moon Bay was analyzed to determine whether the fish are using Half Moon Bay as a feeding area, particularly for juvenile Chinook salmon during

their outmigration. In addition to Chinook salmon, other species collected for stomach content analyses included surf smelt, sandlance, American shad, shiner perch, English sole, speckled sanddab, and sand sole. The most prevalent invertebrates consumed by juvenile Chinook salmon were not abundant in the Half Moon Bay benthic community. *Jassa* sp. were the dominant organism in salmonid gut content (73%). *Jassa* species are tube dwelling amphipods, and known fouling organisms that inhabit flotsam (e.g. kelp and driftwood), pilings, and boat hulls. Stomach content for the forage fish species (herring, shad, surf smelt, and sandlance) was dominated by water column organisms, with very little predation on benthic community organisms. Of the flatfish species, English sole was the most common flatfish present in Half Moon Bay. Stomach content analysis showed that these flatfish appeared to be feeding on polychaetes that were derived from mid and lower intertidal elevations in Half Moon Bay.

Half Moon Bay provides suitable habitat for intertidal and subtidal benthic communities, but does not appear to support a significant food source for fish species within Half Moon Bay, with the exception of English Sole.

## **5.0 CONCLUSIONS**

The benthic infaunal communities in Half Moon Bay were disrupted by the placement of maintenance fill to shore up the South Jetty. This disruption appears to have been short lived and the recovery of the benthic community is proceeding as expected. This conclusion is based on the large number of benthic endpoints that showed no significant differences between the January sampling (pre-disposal event) and the June sampling (post-disposal event). In addition 20 percent of the endpoints indicated that the benthic community sampled in June was enhanced over the sampling that occurred pre-disposal, while only seven percent of the endpoints indicated that the community was depressed post disposal. Many of the differences noted between the two sampling periods could very well be attributed to the recruitment and settlement of juvenile organisms to the benthic community. Furthermore, the dominant and subdominant taxa at stations pre and post-maintenance fill were virtually the same and present at similar abundances.

Stomach content analysis of fish present in Half Moon Bay showed that juvenile salmonids were feeding on *Jassa* sp., a tube dwelling amphipod that inhabits flotsam and pilings. The forage fish were feeding on water column organisms rather than benthic infauna organisms identified in Half Moon Bay. Of the flatfish, only the English sole showed evidence of feeding on intertidal benthic community organisms. Half Moon Bay does not appear to be a significant feeding area for juvenile Chinook salmon during their outmigration.

Benthic sampling methods described in this study provide an effective approach for assessing the impact of breach fill maintenance on benthic habitats in coarse grained sediments. Recommendations for additional data analysis and program enhancements are provided in the following section.

## **6.0 RECOMMENDATIONS**

The following recommendations would allow for a greater understanding of the dynamics of the benthic communities at Half Moon Bay and refine the sampling approach developed for this program.

- A third sampling event in Half Moon Bay conducted sometime between January and March 2005 could help determine whether the benthic community is similar to baseline conditions seen in January 2004. Comparison of results collected during the same season could help isolate the potential effects of seasonal recruitment and settlement of juvenile organisms on the study results.
- One limitation with the current study is the lack of replication at several of the stations in the study area. Normality testing of the data indicated that stations with three replicate sample results were non-normally distributed. However, stations with ten replicates appear to be normally distributed and parametric testing could be conducted. For the sake of comparability, all statistical testing in this study was conducted using nonparametric tests. Since ten replicates were collected at all stations, it is recommended that the remaining seven replicates be processed and analyzed. If this is not feasible, the remaining replicates should be carefully archived for future processing.
- Should future studies of this type be conducted, consideration should be given to sampling at quarterly intervals.
- In future studies, sediment samples to measure the amount of total organic carbon (TOC) should be collected and analyzed. In coarse grained habitats such as those at Half Moon Bay and South Beach, TOC could help explain the benthic community distribution patterns observed at the intertidal content stations.
- Although South Beach is located near Half Moon Bay, the differences in physical characteristics (open coast, gently sloping beach) are such that it may not be the most suitable reference site for Half Moon Bay. Identification of a reference site within Half Moon Bay that is not affected by beach fill maintenance could provide relevant information on seasonal benthic community patterns.

## **7.0 REFERENCES**

- Striplin, P.L. and N. Musgrove. 1999. *Development of Reference Value Project, Task 3: Development of Benthic Effects Sediment Quality Standards*. Prepared for the Washington State Department of Ecology. 49 pages + appendices.
- U. S. Army Corps of Engineers. 2004. *Half Moon Bay and South Beach benthic invertebrate baseline study. Final Report*. Prepared for Seattle District, Corps of Engineers by Science Applications International Corporation. 29 pages + appendices.

## **APPENDICES**

**APPENDIX A**

**FIELD DATA SUMMARY**

- Table A-1. Transect Sample Locations**
- Table A-2. Field Logbook Notes**

**Table A-1.** Half Moon Bay and South Beach transect sample locations.

Transect	Elev. (ft) (MLLW)	Sample ID <sup>a</sup>	NAD83 Easting <sup>b</sup>	NAD83 Northing <sup>b</sup>	Lat. (N) <sup>c</sup>	Long. (W) <sup>c</sup>	Time	Date	Depth (MLLW) <sup>d</sup>
<b>Half Moon Bay Transects (Beach)</b>									
HMB2	0	HMB2+0	733334	593552	46.9037293	-124.1302317	6:34:12	7/1/2004	
HMB2	4	HMB2+4	733212	593531	46.9036572	-124.1307132	6:35:02	7/1/2004	
HMB3	0	HMB3+0	733483	593350	46.9031948	-124.1295987	6:31:36	7/1/2004	
HMB3	4	HMB3+4	733418	593259	46.9029375	-124.1298400	6:30:40	7/1/2004	
HMB3	8	HMB3+8	733392	593222	46.9028329	-124.1299367	13:47:08	6/29/2004	
HMB4	0	HMB4+0	733803	593230	46.9029082	-124.1282965	6:23:55	7/1/2004	
HMB4	4	HMB4+4	733789	593154	46.9026970	-124.1283382	6:23:12	7/1/2004	
HMB4	8	HMB4+8	733780	593098	46.9025438	-124.1283648	13:44:52	6/29/2004	
HMB4	12	HMB4+12	733769	593043	46.9023904	-124.1283989	13:44:31	6/29/2004	
HMB5	0	HMB5+0	734133	593261	46.9030332	-124.1269831	6:25:56	7/1/2004	
HMB5	4	HMB5+4	734151	593190	46.9028426	-124.1268991	6:26:47	7/1/2004	
HMB5	8	HMB5+8	734167	593126	46.9026685	-124.1268233	13:41:00	6/29/2004	
HMB5	12	HMB5+12	734179	593073	46.9025236	-124.1267635	13:41:18	6/29/2004	
<b>Half Moon Bay Transects (Subtidal)</b>									
HMB3	-4	HMBsub1f	733667	593600	46.9039045	-124.1289090	11:26:51	6/29/2004	-4.1
HMB3	-8	HMBsub2a	733839	593847	46.9046005	-124.1282646	9:57:12	6/29/2004	-8.3
HMB3	-12	HMBsub3a	734610	594955	46.9077325	-124.1253876	10:16:35	6/29/2004	-11.8
HMB4	-4	HMBsub4b	733821	593339	46.9032076	-124.1282446	10:34:45	6/29/2004	-3.6
HMB4	-12	HMBsub5a	734057	594664	46.9068662	-124.1275451	10:54:06	6/29/2004	-12.5
HMB5	-4	HMBsub6f	734112	593350	46.9032760	-124.1270844	11:17:14	6/29/2004	-3.4
HMB5	-8	HMBsub7	734023	593677	46.9041601	-124.1275005	11:40:20	6/29/2004	-7.7
HMB5	-12	HMBsub8	733778	594661	46.9068229	-124.1286598	11:58:05	6/29/2004	-11.3
<b>South Beach Transects (Beach)</b>									
SB1	0	SB1+0	731737	593442	46.9032282	-124.1365922	5:13:08	6/30/2004	
SB1	4	SB1+4	732158	593421	46.9032234	-124.1349069	5:10:37	6/30/2004	
SB1	8	SB1+8	732463	593406	46.9032208	-124.1336848	5:08:58	6/30/2004	
SB1	12	SB1+12	732671	593396	46.9032183	-124.1328505	5:06:53	6/30/2004	
SB2	0	SB2+0	731936	592519	46.9007239	-124.1356278	5:17:53	6/30/2004	
SB2	4	SB2+4	732372	592610	46.9010292	-124.1338999	5:19:58	6/30/2004	
SB2	8	SB2+8	732627	592664	46.9012073	-124.1328925	5:21:35	6/30/2004	
SB2	12	SB2+12	732771	592694	46.9013101	-124.1323207	5:22:33	6/30/2004	

a Station ID for subtidal stations at Half Moon Bay represent grab sample locations.

b Northings and Eastings in NAD83-91 State Plane Washington South Zone 4602 (US Survey Feet)

c Latitude and Longitude in NAD83 (ddd.dddddddd)

d Measured depth at time of sampling. Depths measured at transducer are 46 feet offset from sample location, at various headings. Depths in NOS Mean Lower Low Water

**Table A-2. Field Logbook Notes: Invertebrate Sampling at Half Moon Bay and South Beach.**

Date	Time	Station	Sediment Comments / Observations	Clam Comments / Observations
6/29/2004	0845-0915	-	Arrive at Coast Guard station and load gear onto the Corps vessel Shoalhunter. Personnel included; J. Nakayama, C. Hunt, T. Garity, K. Kinared, Ed. Following a safety briefing the vessel departed the dock. Weather was overcast, relatively calm and cool (~55-60 degrees F)	
6/29/2004	915	-	J. Nakayama and K. Kinared verified stations. It was noted that station locations would be slightly different than the January surveys due to elevation changes as sites were originally based on elevation.	
6/29/2004	937	HMBsub1	Due to large rocks mixed in with the sandy material 5 or 6 attempts were made but an acceptable sample was not collected and it was agreed that we would re-visit this site later to obtain a good sample. There were some polychaetes visible in the rejected samples.	
6/29/2004	955	HMBsub2	Penetration was approximately 13-14 cm. Sediment was comprised of fine to medium sand, scattered fine shell pieces, one ~4 cm juvenile Dungeness crab.	
6/29/2004	1015	HMBsub3	Penetration was approximately 12-13 cm. Well sorted sample comprised of medium to fine sand.	
6/29/2004	1035	HMBsub4	Penetration was approximately 10-11 cm. Poorly sorted sample with brown silt on surface, scattered gravels, reduced fine to medium sand < 5 cm.	
6/29/2004	1050	HMBsub5	First attempt to collect sediment at this station resulted in an over-penetrated sample which was rejected, That sample included coarse sand to gravel. The acceptable sample was collected approximately 5 feet from the first attempt. Penetration was approximately 10-11 cm. Well sorted sample comprised of medium to fine sand.	
6/29/2004	1115	HMBsub6	The first several attempts to collect sediment were rejected due to large rocks getting caught in the grab. The acceptable sample penetrated to a depth of 6-7 cm. The sample included medium to fine well-sorted sand. Small white annelids were visible, as were scattered shell particles.	
6/29/2004	1125	HMBsub1	This station was re-sampled due to failure to collect an acceptable sample earlier in the day. Penetration was 8-9 cm. The material was comprised of olive-gray fine to medium poorly-sorted sand with scattered shell pieces. White annelids appeared abundant in the sample.	
6/29/2004	1145	HMBsub7	Penetration was 13-14 cm. Well-sorted	

Date	Time	Station	Sediment Comments / Observations	Clam Comments / Observations
			olive-brown to gray medium to fine sand. Large polychaetes visible (Nereis?).	
6/29/2004	1200	HMBsub8	Penetration was 10-11 cm. Well-sorted fine to medium sand.	
6/29/2004	1245	-	Returned to Coast Guard station and DeMOBed the Shoalhunter.	
6/29/2004	1415	-	Arrived at the Westhaven State Park, mixed preservative chemicals, MOBed gear for collecting +8' and +12' stations. Waited for Shoalhunter crew to mark stations with dGPS. The sampling crew included J. Nakayama, C. Hunt, M. Goff, and G. Caterra.	
6/29/2004	1450	HMB5+8	Damp olive-brown fine to medium sand with scattered fine shell pieces.	
6/29/2004	1505	HMB5+12	Dry sand, generally medium grained, although mixed with some coarse-grained sand deeper in the core samples.	
6/29/2004	1525	HMB4+8	Slightly damp, olive-brown, medium-grained sand with scattered gravels.	
6/29/2004	1535	HMB4+12	Dry, loose, tan-gray, medium to fine grained sand with scattered shell pieces and large gravels.	
6/29/2004	1550	HMB3+8	Damp, olive-brown, fine to medium grained sand with scattered gravels.	
6/29/2004	1615	-	Returned to the van and loaded up the Half Moon Bay +8' and +12' samples.	
6/30/2004	0435-0500	-	MOBed up sampling equipment at Westhaven State Park. Weather was overcast and cool (~55 degrees F).	
6/30/2004	525	SB2+0	Olive, tan and brown medium to fine grained sand with scattered Dendraster shells.	
6/30/2004	540	SB1+0	Similar to SB2+0.	
6/30/2004	550	SB1+4	Tan brown fine to medium grained sand with scattered shell pieces and pebbles.	
6/30/2004	600	SB1+8	Tan brown fine to medium grained sand with scattered pebbles on surface. Amphipods were visibly abundant as they hopped on the sand surface.	
6/30/2004	610	SB1+12	Dry, tan-gray medium grained sand with sand waves/ripples on the surface. A sea lion carcass was lying on the sand roughly 25 feet from the station.	
6/30/2004	620	SB2+4	Moist, tan-gray to brown fine to medium grained sand.	
6/30/2004	630	SB2+8	Moist, tan brown fine to medium grained sand with scattered shell pieces, pebbles and sand waves on the surface. Some darker colored bands on the surface. Abundant amphipods on the surface, and polychaetes at depth. Mole crabs were abundant in one sample.	
6/30/2004	640	SB2+12	Dry, tan-gray fine to medium grained sand, with sand waves/ripples on the surface.	
6/30/2004	720	-	DeMOB, including taping and packing sample jars.	
7/1/2004	535	-	Arrive at Westhaven State Park and prep	

Date	Time	Station	Sediment Comments / Observations	Clam Comments / Observations
			for HMB+0' and +4'.	
7/1/2004	635	HMB4+0	Wet, gray, sandy gravel with scattered shell debris.	No clams present in 0.25 m <sup>2</sup> quadrat sampled to 30 cm depth.
7/1/2004	645	HMB5+0	Fine to medium grained sand mixed with rocks and gravel. This site was difficult to get samples due to the large number of rocks, resulting in a core penetration depth of 5-10 cm.	No clams present in 0.25 m <sup>2</sup> quadrat sampled to 30 cm depth.
7/1/2004	710	HMB3+0	Medium grained sand with scattered gravels. Not as bad as HMB4+0 as far as subsurface rocks and gravel.	One shrimp, 2 polychaetes, and 2 hermit crabs were found in the quadrat. Shell debris was abundant.
7/1/2004	725	HMB2+0	This station is clearly higher up on the beach as a result of dredge material placement at this location. Poorly-sorted, fine to coarse grained sand with scattered to moderate fine shell debris.	Reference polychaetes were present, along with a heart cockle (71 mm), broken <i>Mya arenaria</i> (indet.), a small <i>M. arenaria</i> (20 mm), and one nemertean.
7/1/2004	750	HMB2+4	Station is at cobble line. Sample was collected below where the sand is present (~5 ft below station marker). Moist to wet, tan-brown medium sand grading down to coarse sand with depth. Fine shell debris (moderate) with scattered cobbles present.	
7/1/2004	805	HMB3+4	Tan-brown, medium grained sand with moderate coarse sand and gravel/rocks with depth.	
7/1/2004	815	HMB4+4	Damp to moist, tan-brown medium to fine grained sand grading plus coarse sand, gravel, and cobble with depth. Very difficult to collect samples at this station.	
7/1/2004	855	HMB5+4	Fine to coarse grained sand with abundant gravels.	
7/1/2004	945	-	DeMOB, including taping and packing sample jars.	

Half Moon Bay clam survey field photos.



Figure 1. Clam sampling quadrat at Station HMB2+0



Figure 2. Cockle observed at Station HMB2+0

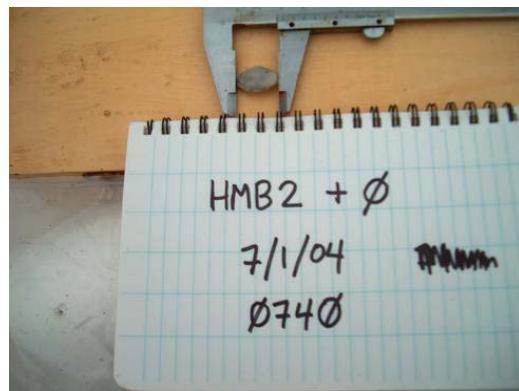


Figure 3. *Mya arenaria* observed at Station HMB2+0

## **APPENDIX B**

### **BENTHIC INFRAUNA ANALYSIS RESULTS**

**Table B-1. Abundance and Taxa Data by Replicate**

**Table B-2. Biomass Data By Replicate**

**Table B-3. Raw Benthic Infrauna Analysis Results**

**TABLE B-1**

**ABUNDANCE AND TAXA DATA BY REPLICATE**

**POOLED ADULT AND JUVENILE DATA**

**Half Moon Bay and South Beach**

**Table B-1. Abundance and Taxa by replicate - Combined adult and juvenile data - Half Moon Bay and South Beach**

Station Replicate	HMB2+4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	18	12	13	43	14.33	3.215
Miscellaneous Abundance	11	7	5	23	7.67	3.055
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	1	1	0	2	0.67	0.577
Annelida Abundance	6	4	8	18	6.00	2.000
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	4	4	6		4.67	1.155
Miscellaneous No. of Taxa	2	1	1		1.33	0.577
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	1	1	0		0.67	0.577
Annelida No. of Taxa	3	3	6		4.00	1.732
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB2+0										Pooled	Mean	Std Dev
	A	B	C	D	E	F	G	H	I	J			
Total Abundance	46	13	40	88	1	72	23	8	27	23	341	34.1	27.962
Miscellaneous Abundance	22	3	29	27	0	25	12	4	14	6	142	14.2	10.871
Mollusca Abundance	1	1	0	10	0	6	2	0	0	1	21	2.1	3.315
Arthropoda Abundance	16	6	2	35	0	37	5	1	8	13	123	12.3	13.483
Annelida Abundance	6	2	2	16	1	4	3	3	5	3	45	4.5	4.301
Ectoprocta Abundance	1	1	3	0	0	0	1	0	0	0	6	0.6	0.966
Insecta Abundance	0	0	4	0	0	0	0	0	0	0	4	0.4	1.265
Total Number of Taxa	11	10	9	18	1	10	10	6	11	13		9.9	4.383
Miscellaneous No. of Taxa	2	2	2	3	0	2	3	2	3	3		2.2	0.919
Mollusca No. of Taxa	1	1	0	1	0	1	1	0	0	1		0.6	0.516
Arthropoda No. Of Taxa	3	4	2	5	0	5	3	1	3	6		3.2	1.874
Annelida No. of Taxa	4	2	1	9	1	2	2	3	5	3		3.2	2.394
Ectoprocta No. of Taxa	1	1	2	0	0	0	1	0	0	0		0.5	0.707
Insecta No. of Taxa	0	0	2	0	0	0	0	0	0	0		0.2	0.632

Station Replicate	HMB3+8			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	23	13	19	55	18.33	5.033
Miscellaneous Abundance	22	12	2	36	12.00	10.000
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	1	0	1	0.33	0.577
Annelida Abundance	0	0	17	17	5.67	9.815
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	1	0	0	1	0.33	0.577
Total Number of Taxa	1	1	1		1.00	0.000
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	1	0		0.33	0.577
Annelida No. of Taxa	0	0	1		0.33	0.577
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	1	0	0		0.33	0.577

Station Replicate	HMB3+4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	49	46	30	125	41.67	10.214
Miscellaneous Abundance	47	46	26	119	39.67	11.846
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	2	0	4	6	2.00	2.000
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	2	0	1		1.00	1.000
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	2	0	1		1.00	1.000
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB3+0			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	23	18	17	58	19.33	3.215
Miscellaneous Abundance	21	14	12	47	15.67	4.726
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	1	0	2	3	1.00	1.000
Annelida Abundance	1	4	3	8	2.67	1.528
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	2	2	4		2.67	1.155
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	1	0	1		0.67	0.577
Annelida No. of Taxa	1	2	3		2.00	1.000
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB3-4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	34	31	44	109	36.33	6.807
Miscellaneous Abundance	7	10	12	29	9.67	2.517
Mollusca Abundance	3	1	2	6	2.00	1.000
Arthropoda Abundance	5	9	2	16	5.33	3.512
Annelida Abundance	19	11	28	58	19.33	8.505
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	8	6	7		7.00	1.000
Miscellaneous No. of Taxa	0	0	0		0.00	0.000
Mollusca No. of Taxa	1	1	1		1.00	0.000
Arthropoda No. of Taxa	1	1	1		1.00	0.000
Annelida No. of Taxa	6	4	5		5.00	1.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Rep	HMB3-8			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	34	38	70	142	47.33	19.732
Miscellaneous Abundance	9	25	19	53	17.67	8.083
Mollusca Abundance	0	1	3	4	1.33	1.528
Arthropoda Abundance	2	2	10	14	4.67	4.619
Annelida Abundance	23	10	38	71	23.67	14.012
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	8	9	9		8.67	0.577
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	0	1	2		1.00	1.000
Arthropoda No. of Taxa	1	1	2		1.33	0.577
Annelida No. of Taxa	6	6	4		5.33	1.155
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Rep	HMB3-12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	271	112	110	493	164.33	92.381
Miscellaneous Abundance	8	10	8	26	8.67	1.155
Mollusca Abundance	0	1	3	4	1.33	1.528
Arthropoda Abundance	7	4	1	12	4.00	3.000
Annelida Abundance	256	97	98	451	150.33	91.511
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	7	6	8		7.00	1.000
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	0	1	1		0.67	0.577
Arthropoda No. of Taxa	3	2	1		2.00	1.000
Annelida No. of Taxa	3	2	5		3.33	1.528
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB4+12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	1	3	0	4	1.33	1.528
Miscellaneous Abundance	0	2	0	2	0.67	1.155
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	1	1	0	2	0.67	0.577
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	1	1	0		0.67	0.577
Miscellaneous No. of Taxa	0	1	0		0.33	0.577
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	1	1	0		0.67	0.577
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB4+8										Pooled	Mean	Std Dev
	A	B	C	D	E	F	G	H	I	J			
Total Abundance	2	7	8	4	4	6	7	13	10	6	67	6.7	3.164
Miscellaneous Abundance	1	5	0	2	3	3	3	7	6	6	36	3.6	2.319
Mollusca Abundance	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Arthropoda Abundance	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Annelida Abundance	1	2	8	2	1	3	4	6	4	0	31	3.1	2.470
Ectoprocta Abundance	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Insecta Abundance	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Total Number of Taxa	2	2	1	2	2	2	2	2	2	1		1.8	0.422
Miscellaneous No. of Taxa	1	1	0	1	1	1	1	1	1	1		0.9	0.316
Mollusca No. of Taxa	0	0	0	0	0	0	0	0	0	0		0	0.000
Arthropoda No. Of Taxa	0	0	0	0	0	0	0	0	0	0		0	0.000
Annelida No. of Taxa	1	1	1	1	1	1	1	1	1	0		0.9	0.316
Ectoprocta No. of Taxa	0	0	0	0	0	0	0	0	0	0		0	0.000
Insecta No. of Taxa	0	0	0	0	0	0	0	0	0	0		0	0.000

Station Replicate	HMB4+4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	14	21	13	48	16.00	4.359
Miscellaneous Abundance	8	11	8	27	9.00	1.732
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	6	10	5	21	7.00	2.646
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	3	3	2		2.67	0.577
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	3	3	2		2.67	0.577
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB4+0			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	14	8	18	40	13.33	5.033
Miscellaneous Abundance	6	5	9	20	6.67	2.082
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	8	3	9	20	6.67	3.215
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	1	2	3		2.00	1.000
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	1	2	3		2.00	1.000
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Rep	HMB4-4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	120	96	98	314	104.67	13.317
Miscellaneous Abundance	1	4	3	8	2.67	1.528
Mollusca Abundance	19	9	5	33	11.00	7.211
Arthropoda Abundance	63	46	62	171	57.00	9.539
Annelida Abundance	37	37	28	102	34.00	5.196
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	15	11	16		14.00	2.646
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	2	1	1		1.33	0.577
Arthropoda No. of Taxa	8	4	9		7.00	2.646
Annelida No. of Taxa	4	5	5		4.67	0.577
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Rep	HMB4-12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	234	99	529	862	287.33	219.905
Miscellaneous Abundance	47	11	26	84	28.00	18.083
Mollusca Abundance	1	2	1	4	1.33	0.577
Arthropoda Abundance	1	1	1	3	1.00	0.000
Annelida Abundance	185	85	501	771	257.00	217.145
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	6	8	6		6.67	1.155
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	1	2	1		1.33	0.577
Arthropoda No. of Taxa	1	1	1		1.00	0.000
Annelida No. of Taxa	3	4	3		3.33	0.577
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB5+12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	1	1	74	76	25.33	42.147
Miscellaneous Abundance	0	0	56	56	18.67	32.332
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	1	1	18	20	6.67	9.815
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	1	1	5		2.33	2.309
Miscellaneous No. of Taxa	0	0	2		0.67	1.155
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	1	1	3		1.67	1.155
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB5+8			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	14	18	10	42	14.00	4.000
Miscellaneous Abundance	13	15	5	33	11.00	5.292
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	1	3	5	9	3.00	2.000
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	2	2	2		2.00	0.000
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	1	1	1		1.00	0.000
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB5+4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	11	11	10	32	10.67	0.577
Miscellaneous Abundance	4	10	9	23	7.67	3.215
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	7	1	1	9	3.00	3.464
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	4	3	2		3.00	1.000
Miscellaneous No. of Taxa	1	2	1		1.33	0.577
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	3	1	1		1.67	1.155
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB5+0			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	6	11	33	50	16.67	14.364
Miscellaneous Abundance	6	10	32	48	16.00	14.000
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	1	1	0.33	0.577
Annelida Abundance	0	1	0	1	0.33	0.577
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	1	2	2		1.67	0.577
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	1		0.33	0.577
Annelida No. of Taxa	0	1	0		0.33	0.577
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Rep	HMB5-4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	41	60	39	140	46.67	11.590
Miscellaneous Abundance	9	24	23	56	18.67	8.386
Mollusca Abundance	0	3	0	3	1.00	1.732
Arthropoda Abundance	5	9	2	16	5.33	3.512
Annelida Abundance	27	24	14	65	21.67	6.807
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	8	10	6		8.00	2.000
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	0	1	0		0.33	0.577
Arthropoda No. of Taxa	2	2	1		1.67	0.577
Annelida No. of Taxa	5	6	4		5.00	1.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Rep	HMB5-8										Pooled	Mean	Std Dev
	A	B	C	D	E	F	G	H	I	J			
Total Abundance	18	47	38	71	25	35	45	39	80	83	481	48.1	22.526
Miscellaneous Abundance	4	3	16	19	9	12	6	18	17	18	122	12.2	6.250
Mollusca Abundance	1	5	2	3	2	4	2	0	14	2	35	3.5	3.951
Arthropoda Abundance	9	12	7	23	1	0	18	5	17	33	125	12.5	10.374
Annelida Abundance	4	27	13	26	13	19	19	16	31	30	198	19.8	8.677
Insecta Abundance	0	0	0	0	0	0	0	0	1	0	1	0.1	0.316
Total Number of Taxa	6	10	11	12	9	5	13	12	13	12		10.3	2.830
Miscellaneous No. of Taxa	1	1	1	1	1	1	1	2	1	1		1.1	0.316
Mollusca No. of Taxa	1	1	1	2	2	1	1	0	1	1		1.1	0.568
Arthropoda No. of Taxa	1	2	2	5	1	0	4	2	4	3		2.4	1.578
Annelida No. of Taxa	3	6	7	4	5	3	7	8	6	7		5.6	1.776
Insecta No. of Taxa	0	0	0	0	0	0	0	0	1	0		0.1	0.316

Station Rep	HMB5-12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	275	153	368	796	265.33	107.825
Miscellaneous Abundance	44	39	108	191	63.67	38.475
Mollusca Abundance	2	0	0	2	0.67	1.155
Arthropoda Abundance	0	4	5	9	3.00	2.646
Annelida Abundance	229	110	255	594	198.00	77.311
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	8	7	9		8.00	1.000
Miscellaneous No. of Taxa	1	1	2		1.33	0.577
Mollusca No. of Taxa	1	0	0		0.33	0.577
Arthropoda No. of Taxa	0	2	2		1.33	1.155
Annelida No. of Taxa	6	4	5		5.00	1.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	SB1+0			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	151	124	211	486	162.00	44.531
Miscellaneous Abundance	150	114	180	444	148.00	33.045
Arthropoda Abundance	0	0	1	1	0.33	0.577
Annelida Abundance	0	10	30	40	13.33	15.275
Insecta Abundance	1	0	0	1	0.33	0.577
Total Number of Taxa	2	4	5		3.67	1.528
Miscellaneous No. of Taxa	1	2	2		1.67	0.577
Arthropoda No. of Taxa	0	0	1		0.33	0.577
Annelida No. of Taxa	0	2	2		1.33	1.155
Insecta No. of Taxa	1	0	0		0.33	0.577

Station Replicate	SB1+4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	73	52	3	128	42.67	35.921
Miscellaneous Abundance	70	48	1	119	39.67	35.247
Arthropoda Abundance	0	0	1	1	0.33	0.577
Annelida Abundance	3	4	1	8	2.67	1.528
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	3	3	3		3.00	0.000
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Arthropoda No. of Taxa	0	0	1		0.33	0.577
Annelida No. of Taxa	2	2	1		1.67	0.577
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	SB1+8			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	96	93	83	272	90.67	6.807
Miscellaneous Abundance	73	65	66	204	68.00	4.359
Arthropoda Abundance	22	24	16	62	20.67	4.163
Annelida Abundance	1	4	1	6	2.00	1.732
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	3	5	3		3.67	1.155
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Arthropoda No. of Taxa	1	2	1		1.33	0.577
Annelida No. of Taxa	1	2	1		1.33	0.577
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	SB1+12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	2	1	1	4	1.33	0.577
Miscellaneous Abundance	1	0	0	1	0.33	0.577
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	1	0	0	1	0.33	0.577
Insecta Abundance	0	1	1	2	0.67	0.577
Total Number of Taxa	2	1	1		1.33	0.577
Miscellaneous No. of Taxa	1	0	0		0.33	0.577
Arthropoda No. of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	1	0	0		0.33	0.577
Insecta No. of Taxa	0	1	1		0.67	0.577

Station Replicate	SB2+0			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	91	118	100	309	103.00	13.748
Miscellaneous Abundance	87	106	100	293	97.67	9.713
Arthropoda Abundance	1	2	0	3	1.00	1.000
Annelida Abundance	3	10	0	13	4.33	5.132
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	5	9	2		5.33	3.512
Miscellaneous No. of Taxa	2	1	2		1.67	0.577
Arthropoda No. of Taxa	1	2	0		1.00	1.000
Annelida No. of Taxa	2	6	0		2.67	3.055
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	SB2+4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	15	27	31	73	24.33	8.327
Miscellaneous Abundance	8	24	23	55	18.33	8.963
Arthropoda Abundance	1	1	2	4	1.33	0.577
Annelida Abundance	6	2	6	14	4.67	2.309
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	6	4	5		5.00	1.000
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Arthropoda No. of Taxa	1	1	2		1.33	0.577
Annelida No. of Taxa	4	2	2		2.67	1.155
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	SB2+8			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	102	44	84	230	76.67	29.687
Miscellaneous Abundance	68	26	40	134	44.67	21.385
Arthropoda Abundance	31	15	27	73	24.33	8.327
Annelida Abundance	3	3	17	23	7.67	8.083
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	3	3	7		4.33	2.309
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Arthropoda No. of Taxa	1	1	1		1.00	0.000
Annelida No. of Taxa	1	1	5		2.33	2.309
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	SB2+12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	2	5	7	14	4.67	2.517
Miscellaneous Abundance	0	1	0	1	0.33	0.577
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	2	3	7	12	4.00	2.646
Insecta Abundance	0	1	0	1	0.33	0.577
Total Number of Taxa	2	3	1		2.00	1.000
Miscellaneous No. of Taxa	0	1	0		0.33	0.577
Arthropoda No. of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	2	1	1		1.33	0.577
Insecta No. of Taxa	0	1	0		0.33	0.577

\*Half Moon Bay Intertidal MISCELLANEOUS abundance and taxa count includes:

CNIDARIA  
Campanulariidae Fragment  
Cnidaria Indet. Fragment  
Hydriida Indet. Fragment  
PLATYHELMINTHES  
Platyhelminthes Indet.  
Nemertea  
Nemertea Indet.  
Tetrastemma sp.  
ENTOPROCTA  
Barentsia sp. colony fragment  
Entoprocta colony fragment

**JUVENILES ONLY**

**Half Moon Bay and South Beach**

**Table B-1. Abundance and Taxa by replicate - Juvenile data - Half Moon Bay and South Beach**

Station Replicate	HMB2+4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	13	9	10	32	10.67	2.082
Miscellaneous Abundance	10	5	5	20	6.67	2.887
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	3	4	5	12	4.00	1.000
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	2	3	4		3.00	1.000
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	2	3	4		3.00	1.000
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB2+0										Pooled	Mean	Std Dev
	A	B	C	D	E	F	G	H	I	J			
Total Abundance	29	10	36	56	1	36	17	6	14	14	219	21.9	16.967
Miscellaneous Abundance	21	1	28	26	0	25	9	3	12	3	128	12.8	11.213
Mollusca Abundance	1	1	0	10	0	6	2	0	0	1	21	2.1	3.315
Arthropoda Abundance	1	6	2	4	0	1	3	1	0	8	26	2.6	2.675
Annelida Abundance	5	2	2	16	1	4	3	2	2	2	39	3.9	4.408
Ectoprocta Abundance	1	0	0	0	0	0	0	0	0	0	1	0.1	0.316
Insecta Abundance	0	0	4	0	0	0	0	0	0	0	4	0.4	1.265
Total Number of Taxa	8	8	6	14	1	6	6	4	4	8		6.5	3.440
Miscellaneous No. of Taxa	1	1	1	2	0	2	1	1	2	1		1.2	0.632
Mollusca No. of Taxa	1	1	0	1	0	1	1	0	0	1		0.6	0.516
Arthropoda No. Of Taxa	1	4	2	2	0	1	2	1	0	4		1.7	1.418
Annelida No. of Taxa	4	2	1	9	1	2	2	2	2	2		2.7	2.359
Ectoprocta No. of Taxa	1	0	0	0	0	0	0	0	0	0		0.1	0.316
Insecta No. of Taxa	0	0	2	0	0	0	0	0	0	0		0.2	0.632

Station Replicate	HMB3+8			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	22	13	3	38	12.67	9.504
Miscellaneous Abundance	22	12	2	36	12.00	10.000
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	1	0	1	0.33	0.577
Annelida Abundance	0	0	1	1	0.33	0.577
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	0	1	1		0.67	0.577
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	1	0		0.33	0.577
Annelida No. of Taxa	0	0	1		0.33	0.577
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB3+4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	25	46	30	101	33.67	10.970
Miscellaneous Abundance	24	46	26	96	32.00	12.166
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	1	0	4	5	1.67	2.082
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	1	0	1		0.67	0.577
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	1	0	1		0.67	0.577
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB3+0			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	22	18	16	56	18.67	3.055
Miscellaneous Abundance	21	14	12	47	15.67	4.726
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	1	1	0.33	0.577
Annelida Abundance	1	4	3	8	2.67	1.528
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	1	2	4		2.33	1.528
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	1		0.33	0.577
Annelida No. of Taxa	1	2	3		2.00	1.000
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB3-4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	26	20	40	86	28.67	10.263
Miscellaneous Abundance	7	9	12	28	9.33	2.517
Mollusca Abundance	3	1	2	6	2.00	1.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	16	10	26	52	17.33	8.083
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	7	5	6		6.00	1.000
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	1	1	1		1.00	0.000
Arthropoda No. of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	5	3	4		4.00	1.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB3-8			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	27	29	56	112	37.33	16.197
Miscellaneous Abundance	8	24	19	51	17.00	8.185
Mollusca Abundance	0	1	3	4	1.33	1.528
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	19	4	34	57	19.00	15.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	6	4	6		5.33	1.155
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	0	1	2		1.00	1.000
Arthropoda No. of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	5	2	3		3.33	1.528
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB3-12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	267	109	109	485	161.67	91.221
Miscellaneous Abundance	8	10	8	26	8.67	1.155
Mollusca Abundance	0	1	3	4	1.33	1.528
Arthropoda Abundance	3	1	1	5	1.67	1.155
Annelida Abundance	256	97	97	450	150.00	91.799
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	6	5	7		6.00	1.000
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	0	1	1		0.67	0.577
Arthropoda No. of Taxa	2	1	1		1.33	0.577
Annelida No. of Taxa	3	2	4		3.00	1.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB4+12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	0	2	0	2	0.67	1.155
Miscellaneous Abundance	0	2	0	2	0.67	1.155
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	0	0	0	0	0.00	0.000
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	0	0	0	0.00	0.000	
Miscellaneous No. of Taxa	0	1	0	0.33	0.577	
Mollusca No. of Taxa	0	0	0	0.00	0.000	
Arthropoda No. Of Taxa	0	0	0	0.00	0.000	
Annelida No. of Taxa	0	0	0	0.00	0.000	
Ectoprocta No. of Taxa	0	0	0	0.00	0.000	
Insecta No. of Taxa	0	0	0	0.00	0.000	

Station Replicate	HMB4+8										Pooled	Mean	Std Dev
	A	B	C	D	E	F	G	H	I	J			
Total Abundance	1	5	0	2	3	3	3	7	6	6	36	3.6	2.319
Miscellaneous Abundance	1	5	0	2	3	3	3	7	6	6	36	3.6	2.319
Mollusca Abundance	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Arthropoda Abundance	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Annelida Abundance	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Ectoprocta Abundance	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Insecta Abundance	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Total Number of Taxa	1	1	0	1	1	1	1	1	1	1	0.9	0.316	
Miscellaneous No. of Taxa	1	1	0	1	1	1	1	1	1	1	0.9	0.316	
Mollusca No. of Taxa	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Arthropoda No. Of Taxa	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Annelida No. of Taxa	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Ectoprocta No. of Taxa	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Insecta No. of Taxa	0	0	0	0	0	0	0	0	0	0	0	0	0.000

Station Replicate	HMB4+4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	9	11	8	28	9.33	1.528
Miscellaneous Abundance	7	11	7	25	8.33	2.309
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	2	0	1	3	1.00	1.000
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	1	0	1	0.67	0.577	
Miscellaneous No. of Taxa	1	1	1	1.00	0.000	
Mollusca No. of Taxa	0	0	0	0.00	0.000	
Arthropoda No. Of Taxa	0	0	0	0.00	0.000	
Annelida No. of Taxa	1	0	1	0.67	0.577	
Ectoprocta No. of Taxa	0	0	0	0.00	0.000	
Insecta No. of Taxa	0	0	0	0.00	0.000	

Station Replicate	HMB4+0			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	6	5	8	19	6.33	1.528
Miscellaneous Abundance	6	5	5	16	5.33	0.577
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	0	0	3	3	1.00	1.732
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	0	0	2	0.67	1.155	
Miscellaneous No. of Taxa	1	1	1	1.00	0.000	
Mollusca No. of Taxa	0	0	0	0.00	0.000	
Arthropoda No. Of Taxa	0	0	0	0.00	0.000	
Annelida No. of Taxa	0	0	2	0.67	1.155	
Ectoprocta No. of Taxa	0	0	0	0.00	0.000	
Insecta No. of Taxa	0	0	0	0.00	0.000	

Station Replicate	HMB4-4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	56	38	49	143	47.67	9.074
Miscellaneous Abundance	1	4	3	8	2.67	1.528
Mollusca Abundance	18	9	5	32	10.67	6.658
Arthropoda Abundance	18	0	15	33	11.00	9.644
Annelida Abundance	19	25	26	70	23.33	3.786
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	12	7	13		10.67	3.215
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	1	1	1		1.00	0.000
Arthropoda No. of Taxa	6	0	6		4.00	3.464
Annelida No. of Taxa	4	5	5		4.67	0.577
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB4-12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	232	97	527	856	285.33	219.905
Miscellaneous Abundance	47	11	26	84	28.00	18.083
Mollusca Abundance	1	2	1	4	1.33	0.577
Arthropoda Abundance	0	1	1	2	0.67	0.577
Annelida Abundance	184	83	499	766	255.33	216.980
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	4	7	6		5.67	1.528
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	1	2	1		1.33	0.577
Arthropoda No. of Taxa	0	1	1		0.67	0.577
Annelida No. of Taxa	2	3	3		2.67	0.577
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB5+12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	0	0	0	0	0.00	0.000
Miscellaneous Abundance	0	0	0	0	0.00	0.000
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	0	0	0	0	0.00	0.000
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	0	0	0		0.00	0.000
Miscellaneous No. of Taxa	0	0	0		0.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	0	0	0		0.00	0.000
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB5+8			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	13	14	5	32	10.67	4.933
Miscellaneous Abundance	13	14	5	32	10.67	4.933
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	0	0	0	0	0.00	0.000
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	1	1	1		1.00	0.000
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	0	0	0		0.00	0.000
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB5+4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	6	10	9	25	8.33	2.082
Miscellaneous Abundance	4	9	9	22	7.33	2.887
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	2	1	0	3	1.00	1.000
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	3	2	1		2.00	1.000
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	2	1	0		1.00	1.000
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB5+0			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	6	11	32	49	16.33	13.796
Miscellaneous Abundance	6	10	32	48	16.00	14.000
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	0	1	0	1	0.33	0.577
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	1	2	1		1.33	0.577
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	0	1	0		0.33	0.577
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB5-4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	31	44	36	111	37.00	6.557
Miscellaneous Abundance	8	23	22	53	17.67	8.386
Mollusca Abundance	0	3	0	3	1.00	1.732
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	23	18	14	55	18.33	4.509
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	6	5	5		5.33	0.577
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Mollusca No. of Taxa	0	1	0		0.33	0.577
Arthropoda No. of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	5	3	4		4.00	1.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB5-8										Pooled	Mean	Std Dev
	A	B	C	D	E	F	G	H	I	J			
Total Abundance	8	27	32	40	20	35	30	33	63	48	336	33.6	14.961
Miscellaneous Abundance	4	3	16	17	9	12	5	18	17	18	119	11.9	6.154
Mollusca Abundance	1	4	2	3	2	4	2	0	14	2	34	3.4	3.921
Arthropoda Abundance	0	1	6	1	0	0	6	0	2	1	17	1.7	2.359
Annelida Abundance	3	19	8	19	9	19	17	15	29	27	165	16.5	8.155
Insecta Abundance	0	0	0	0	0	0	0	0	1	0	1	0.1	0.316
Total Number of Taxa	5	6	7	7	6	5	10	10	10	8		7.4	2.011
Miscellaneous No. of Taxa	1	1	1	1	1	1	1	2	1	1		1.1	0.316
Mollusca No. of Taxa	1	1	1	2	2	1	1	0	1	1		1.1	0.568
Arthropoda No. of Taxa	0	1	1	1	0	0	2	0	2	1		0.8	0.789
Annelida No. of Taxa	3	3	4	3	3	3	6	8	5	5		4.3	1.703
Insecta No. of Taxa	0	0	0	0	0	0	0	0	1	0		0.1	0.316

Station Replicate	HMB5-12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	275	148	362	785	261.67	107.621
Miscellaneous Abundance	44	39	108	191	63.67	38.475
Mollusca Abundance	2	0	0	2	0.67	1.155
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	229	109	254	592	197.33	77.513
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	8	4	7		6.33	2.082
Miscellaneous No. of Taxa	1	1	2		1.33	0.577
Mollusca No. of Taxa	1	0	0		0.33	0.577
Arthropoda No. of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	6	3	5		4.67	1.528
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	SB1+0			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	149	122	207	478	159.33	43.432
Miscellaneous Abundance	148	113	178	439	146.33	32.532
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	0	9	29	38	12.67	14.844
Insecta Abundance	1	0	0	1	0.33	0.577
Total Number of Taxa	2	4	3		3.00	1.000
Miscellaneous No. of Taxa	1	2	2		1.67	0.577
Arthropoda No. of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	0	2	1		1.00	1.000
Insecta No. of Taxa	1	0	0		0.33	0.577

Station Replicate	SB1+4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	71	48	0	119	39.67	36.226
Miscellaneous Abundance	70	47	0	117	39.00	35.679
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	1	1	0	2	0.67	0.577
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	2	2	0		1.33	1.155
Miscellaneous No. of Taxa	1	1	0		0.67	0.577
Arthropoda No. of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	1	1	0		0.67	0.577
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	SB1+8			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	78	69	66	213	71.00	6.245
Miscellaneous Abundance	73	65	65	203	67.67	4.619
Arthropoda Abundance	4	1	1	6	2.00	1.732
Annelida Abundance	1	3	0	4	1.33	1.528
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	3	3	2		2.67	0.577
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Arthropoda No. of Taxa	1	1	1		1.00	0.000
Annelida No. of Taxa	1	1	0		0.67	0.577
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	SB1+12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	0	1	1	2	0.67	0.577
Miscellaneous Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	1	1	2	0.67	0.577
Total Number of Taxa	0	1	1		0.67	0.577
Miscellaneous No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	1	1		0.67	0.577

Station Replicate	SB2+0			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	89	113	100	302	100.67	12.014
Miscellaneous Abundance	87	105	100	292	97.33	9.292
Arthropoda Abundance	0	1	0	1	0.33	0.577
Annelida Abundance	2	7	0	9	3.00	3.606
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	3	6	2		3.67	2.082
Miscellaneous No. of Taxa	2	1	2		1.67	0.577
Arthropoda No. of Taxa	0	1	0		0.33	0.577
Annelida No. of Taxa	1	4	0		1.67	2.082
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	SB2+4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	7	23	26	56	18.67	10.214
Miscellaneous Abundance	4	23	21	48	16.00	10.440
Arthropoda Abundance	0	0	1	1	0.33	0.577
Annelida Abundance	3	0	4	7	2.33	2.082
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	4	1	3		2.67	1.528
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Arthropoda No. of Taxa	0	0	1		0.33	0.577
Annelida No. of Taxa	3	0	1		1.33	1.528
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	SB2+8			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	67	23	46	136	45.33	22.008
Miscellaneous Abundance	67	20	35	122	40.67	24.007
Arthropoda Abundance	0	2	5	7	2.33	2.517
Annelida Abundance	0	1	6	7	2.33	3.215
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	1	3	4		2.67	1.528
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Arthropoda No. of Taxa	0	1	1		0.67	0.577
Annelida No. of Taxa	0	1	2		1.00	1.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	SB2+12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	0	1	0	1	0.33	0.577
Miscellaneous Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	1	0	1	0.33	0.577
Total Number of Taxa	0	1	0		0.33	0.577
Miscellaneous No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	1	0		0.33	0.577

\*Half Moon Bay Intertidal MISCELLANEOUS abundance and taxa count includes

CNIDARIA  
Campanulariidae Fragment  
Cnidaria Indet. Fragment  
Hydroids Indet. Fragment  
PLATYHELMINTHES  
Platyhelminthes Indet.  
Nemertea  
Nemertea Indet.  
Tetraspasma sp.  
ENTOPROCTA  
Barentsia sp. colony fragment  
Entoprocta colony fragment

**ADULTS ONLY**

**Half Moon Bay and South Beach**

**Table B-1. Abundance and Taxa by replicate - Adult data - Half Moon Bay and South Beach**

Station Replicate	HMB2+4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	5	3	3	11	3.67	1.155
Miscellaneous Abundance	1	2	0	3	1.00	1.000
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	1	1	0	2	0.67	0.577
Annelida Abundance	3	0	3	6	2.00	1.732
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	2	1	3		2.00	1.000
Miscellaneous No. of Taxa	1	1	0		0.67	0.577
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	1	1	0		0.67	0.577
Annelida No. of Taxa	1	0	3		1.33	1.528
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB2+0										Pooled	Mean	Std Dev
	A	B	C	D	E	F	G	H	I	J			
Total Abundance	17	3	4	32	0	36	6	2	13	9	122	12.2	12.630
Miscellaneous Abundance	1	2	1	1	0	0	3	1	2	3	14	1.4	1.075
Mollusca Abundance	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Arthropoda Abundance	15	0	0	31	0	36	2	0	8	5	97	9.7	13.475
Annelida Abundance	1	0	0	0	0	0	0	1	3	1	6	0.6	0.966
Ectoprocta Abundance	0	1	3	0	0	0	1	0	0	0	5	0.5	0.972
Insecta Abundance	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Total Number of Taxa	4	2	3	5	0	4	5	2	8	6		3.9	2.283
Miscellaneous No. of Taxa	1	1	1	1	0	0	3	1	2	3		1.3	1.059
Mollusca No. of Taxa	0	0	0	0	0	0	0	0	0	0		0	0.000
Arthropoda No. Of Taxa	2	0	0	4	0	4	1	0	3	2		1.6	1.647
Annelida No. of Taxa	1	0	0	0	0	0	0	1	3	1		0.6	0.966
Ectoprocta No. of Taxa	0	1	2	0	0	0	1	0	0	0		0.4	0.699
Insecta No. of Taxa	0	0	0	0	0	0	0	0	0	0		0	0.000

Station Replicate	HMB3+8			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	1	0	16	17	5.67	8.963
Miscellaneous Abundance	0	0	0	0	0.00	0.000
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	0	0	16	16	5.33	9.238
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	1	0	0	1	0.33	0.577
Total Number of Taxa	1	0	1		0.67	0.577
Miscellaneous No. of Taxa	0	0	0		0.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	0	0	1		0.33	0.577
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	1	0	0		0.33	0.577

Station Replicate	HMB3+4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	24	0	0	24	8.00	13.856
Miscellaneous Abundance	23	0	0	23	7.67	13.279
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	1	0	0	1	0.33	0.577
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	1	0	0		0.33	0.577
Miscellaneous No. of Taxa	1	0	0		0.33	0.577
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	1	0	0		0.33	0.577
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB3+0			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	1	0	1	2	0.67	0.577
Miscellaneous Abundance	0	0	0	0	0.00	0.000
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	1	0	1	2	0.67	0.577
Annelida Abundance	0	0	0	0	0.00	0.000
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	1	0	1		0.67	0.577
Miscellaneous No. of Taxa	0	0	0		0.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	1	0	1		0.67	0.577
Annelida No. of Taxa	0	0	0		0.00	0.000
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB3-4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	8	11	4	23	7.67	3.512
Miscellaneous Abundance	0	1	0	1	0.33	0.577
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	5	9	2	16	5.33	3.512
Annelida Abundance	3	1	2	6	2.00	1.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	3	3	2		2.67	0.577
Miscellaneous No. of Taxa	0	1	0		0.33	0.577
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. of Taxa	1	1	1		1.00	0.000
Annelida No. of Taxa	2	1	1		1.33	0.577
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB3-8			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	7	9	14	30	10.00	3.606
Miscellaneous Abundance	1	1	0	2	0.67	0.577
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	2	2	10	14	4.67	4.619
Annelida Abundance	4	6	4	14	4.67	1.155
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	3	7	5		5.00	2.000
Miscellaneous No. of Taxa	1	1	0		0.67	0.577
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. of Taxa	1	1	2		1.33	0.577
Annelida No. of Taxa	1	5	3		3.00	2.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB3-12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	4	3	1	8	2.67	1.528
Miscellaneous Abundance	0	0	0	0	0.00	0.000
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	4	3	0	7	2.33	2.082
Annelida Abundance	0	0	1	1	0.33	0.577
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	2	2	1		1.67	0.577
Miscellaneous No. of Taxa	0	0	0		0.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. of Taxa	2	2	0		1.33	1.155
Annelida No. of Taxa	0	0	1		0.33	0.577
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB4+12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	1	1	0	2	0.67	0.577
Miscellaneous Abundance	0	0	0	0	0.00	0.000
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	1	1	0	2	0.67	0.577
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	1	1	0		0.67	0.577
Miscellaneous No. of Taxa	0	0	0		0.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	1	1	0		0.67	0.577
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB4+8										Pooled	Mean	Std Dev
	A	B	C	D	E	F	G	H	I	J			
Total Abundance	1	2	8	2	1	3	4	6	4	0	31	3.1	2.470
Miscellaneous Abundance	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Mollusca Abundance	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Arthropoda Abundance	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Annelida Abundance	1	2	8	2	1	3	4	6	4	0	31	3.1	2.470
Ectoprocta Abundance	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Insecta Abundance	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Total Number of Taxa	1	1	1	1	1	1	1	1	1	0		0.9	0.316
Miscellaneous No. of Taxa	0	0	0	0	0	0	0	0	0	0		0	0.000
Mollusca No. of Taxa	0	0	0	0	0	0	0	0	0	0		0	0.000
Arthropoda No. Of Taxa	0	0	0	0	0	0	0	0	0	0		0	0.000
Annelida No. of Taxa	1	1	1	1	1	1	1	1	1	0		0.9	0.316
Ectoprocta No. of Taxa	0	0	0	0	0	0	0	0	0	0		0	0.000
Insecta No. of Taxa	0	0	0	0	0	0	0	0	0	0		0	0.000

Station Replicate	HMB4+4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	5	10	5	20	6.67	2.887
Miscellaneous Abundance	1	0	1	2	0.67	0.577
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	4	10	4	18	6.00	3.464
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	2	3	2		2.33	0.577
Miscellaneous No. of Taxa	1	0	1		0.67	0.577
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	2	3	2		2.33	0.577
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB4+0			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	8	3	10	21	7.00	3.606
Miscellaneous Abundance	0	0	4	4	1.33	2.309
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	8	3	6	17	5.67	2.517
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	1	2	1		1.33	0.577
Miscellaneous No. of Taxa	0	0	1		0.33	0.577
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	1	2	1		1.33	0.577
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB4-4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	64	58	49	171	57.00	7.550
Miscellaneous Abundance	0	0	0	0	0.00	0.000
Mollusca Abundance	1	0	0	1	0.33	0.577
Arthropoda Abundance	45	46	47	138	46.00	1.000
Annelida Abundance	18	12	2	32	10.67	8.083
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	6	5	5		5.33	0.577
Miscellaneous No. of Taxa	0	0	0		0.00	0.000
Mollusca No. of Taxa	1	0	0		0.33	0.577
Arthropoda No. of Taxa	4	4	4		4.00	0.000
Annelida No. of Taxa	1	1	1		1.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB4-12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	2	2	2	6	2.00	0.000
Miscellaneous Abundance	0	0	0	0	0.00	0.000
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	1	0	0	1	0.33	0.577
Annelida Abundance	1	2	2	5	1.67	0.577
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	2	2	2		2.00	0.000
Miscellaneous No. of Taxa	0	0	0		0.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. of Taxa	1	0	0		0.33	0.577
Annelida No. of Taxa	1	2	2		1.67	0.577
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB5+12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	1	1	0	2	0.67	0.577
Miscellaneous Abundance	0	0	0	0	0.00	0.000
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	1	1	0	2	0.67	0.577
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	1	1	0		0.67	0.577
Miscellaneous No. of Taxa	0	0	0		0.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	1	1	0		0.67	0.577
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB5+8			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	1	4	5	10	3.33	2.082
Miscellaneous Abundance	0	1	0	1	0.33	0.577
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	1	3	5	9	3.00	2.000
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	1	2	1		1.33	0.577
Miscellaneous No. of Taxa	0	1	0		0.33	0.577
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	1	1	1		1.00	0.000
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB5+4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	5	1	1	7	2.33	2.309
Miscellaneous Abundance	0	1	0	1	0.33	0.577
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	5	0	1	6	2.00	2.646
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	2	1	1		1.33	0.577
Miscellaneous No. of Taxa	0	1	0		0.33	0.577
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	2	0	1		1.00	1.000
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB5+0			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	0	0	1	1	0.33	0.577
Miscellaneous Abundance	0	0	0	0	0.00	0.000
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	0	1	1	0.33	0.577
Annelida Abundance	0	0	0	0	0.00	0.000
Ectoprocta Abundance	0	0	0	0	0.00	0.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	0	0	1		0.33	0.577
Miscellaneous No. of Taxa	0	0	0		0.00	0.000
Mollusca No. of Taxa	0	0	0		0.00	0.000
Arthropoda No. Of Taxa	0	0	1		0.33	0.577
Annelida No. of Taxa	0	0	0		0.00	0.000
Ectoprocta No. of Taxa	0	0	0		0.00	0.000
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	HMB5-4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	10	16	3	29	9.67	6.506
Miscellaneous Abundance	1	1	1	3	1.00	0.000
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	5	9	2	16	5.33	3.512
Annelida Abundance	4	6	0	10	3.33	3.055
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	4	6	2	4.00	2.000	
Miscellaneous No. of Taxa	1	1	1	1.00	0.000	
Mollusca No. of Taxa	0	0	0	0.00	0.000	
Arthropoda No. of Taxa	2	2	1	1.67	0.577	
Annelida No. of Taxa	1	3	0	1.33	1.528	
Insecta No. of Taxa	0	0	0	0.00	0.000	

Station Replicate	HMB5-8										Pooled	Mean	Std Dev
	A	B	C	D	E	F	G	H	I	J			
Total Abundance	10	20	6	31	5	0	15	6	17	35	145	14.5	11.521
Miscellaneous Abundance	0	0	0	2	0	0	1	0	0	0	3	0.3	0.675
Mollusca Abundance	0	1	0	0	0	0	0	0	0	0	1	0.1	0.316
Arthropoda Abundance	9	11	1	22	1	0	12	5	15	32	108	10.8	10.218
Annelida Abundance	1	8	5	7	4	0	2	1	2	3	33	3.3	2.669
Insecta Abundance	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Total Number of Taxa	2	6	4	7	3	0	6	3	5	5		4.1	2.132
Miscellaneous No. of Taxa	0	0	0	1	0	0	1	0	0	0		0.2	0.422
Mollusca No. of Taxa	0	1	0	0	0	0	0	0	0	0		0.1	0.316
Arthropoda No. of Taxa	1	1	1	4	1	0	3	2	3	3		1.9	1.287
Annelida No. of Taxa	1	4	3	2	2	0	2	1	2	2		1.9	1.101
Insecta No. of Taxa	0	0	0	0	0	0	0	0	0	0		0	0.000

Station Replicate	HMB5-12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	0	5	6	11	3.67	3.215
Miscellaneous Abundance	0	0	0	0	0.00	0.000
Mollusca Abundance	0	0	0	0	0.00	0.000
Arthropoda Abundance	0	4	5	9	3.00	2.646
Annelida Abundance	0	1	1	2	0.67	0.577
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	0	3	3	2.00	1.732	
Miscellaneous No. of Taxa	0	0	0	0.00	0.000	
Mollusca No. of Taxa	0	0	0	0.00	0.000	
Arthropoda No. of Taxa	0	2	2	1.33	1.155	
Annelida No. of Taxa	0	1	1	0.67	0.577	
Insecta No. of Taxa	0	0	0	0.00	0.000	

Station Replicate	SB1+0			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	2	2	4	8	2.67	1.155
Miscellaneous Abundance	2	1	2	5	1.67	0.577
Arthropoda Abundance	0	0	1	1	0.33	0.577
Annelida Abundance	0	1	1	2	0.67	0.577
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	1	2	3		2.00	1.000
Miscellaneous No. of Taxa	1	1	1		1.00	0.000
Arthropoda No. of Taxa	0	0	1		0.33	0.577
Annelida No. of Taxa	0	1	1		0.67	0.577
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	SB1+4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	2	4	3	9	3.00	1.000
Miscellaneous Abundance	0	1	1	2	0.67	0.577
Arthropoda Abundance	0	0	1	1	0.33	0.577
Annelida Abundance	2	3	1	6	2.00	1.000
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	1	3	3		2.33	1.155
Miscellaneous No. of Taxa	0	1	1		0.67	0.577
Arthropoda No. of Taxa	0	0	1		0.33	0.577
Annelida No. of Taxa	1	2	1		1.33	0.577
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	SB1+8			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	18	24	17	59	19.67	3.786
Miscellaneous Abundance	0	0	1	1	0.33	0.577
Arthropoda Abundance	18	23	15	56	18.67	4.041
Annelida Abundance	0	1	1	2	0.67	0.577
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	1	3	3		2.33	1.155
Miscellaneous No. of Taxa	0	0	1		0.33	0.577
Arthropoda No. of Taxa	1	2	1		1.33	0.577
Annelida No. of Taxa	0	1	1		0.67	0.577
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	SB1+12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	2	0	0	2	0.67	1.155
Miscellaneous Abundance	1	0	0	1	0.33	0.577
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	1	0	0	1	0.33	0.577
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	2	0	0		0.67	1.155
Miscellaneous No. of Taxa	1	0	0		0.33	0.577
Arthropoda No. of Taxa	0	0	0		0.00	0.000
Annelida No. of Taxa	1	0	0		0.33	0.577
Insecta No. of Taxa	0	0	0		0.00	0.000

Station Replicate	SB2+0			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	2	5	0	7	2.33	2.517
Miscellaneous Abundance	0	1	0	1	0.33	0.577
Arthropoda Abundance	1	1	0	2	0.67	0.577
Annelida Abundance	1	3	0	4	1.33	1.528
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	2	4	0	2.00	2.000	
Miscellaneous No. of Taxa	0	1	0	0.33	0.577	
Arthropoda No. of Taxa	1	1	0	0.67	0.577	
Annelida No. of Taxa	1	2	0	1.00	1.000	
Insecta No. of Taxa	0	0	0	0.00	0.000	

Station Replicate	SB2+4			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	8	4	5	17	5.67	2.082
Miscellaneous Abundance	4	1	2	7	2.33	1.528
Arthropoda Abundance	1	1	1	3	1.00	0.000
Annelida Abundance	3	2	2	7	2.33	0.577
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	4	4	4	4.00	0.000	
Miscellaneous No. of Taxa	1	1	1	1.00	0.000	
Arthropoda No. of Taxa	1	1	1	1.00	0.000	
Annelida No. of Taxa	2	2	2	2.00	0.000	
Insecta No. of Taxa	0	0	0	0.00	0.000	

Station Replicate	SB2+8			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	35	21	38	94	31.33	9.074
Miscellaneous Abundance	1	6	5	12	4.00	2.646
Arthropoda Abundance	31	13	22	66	22.00	9.000
Annelida Abundance	3	2	11	16	5.33	4.933
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	3	3	6	4.00	1.732	
Miscellaneous No. of Taxa	1	1	1	1.00	0.000	
Arthropoda No. of Taxa	1	1	1	1.00	0.000	
Annelida No. of Taxa	1	1	4	2.00	1.732	
Insecta No. of Taxa	0	0	0	0.00	0.000	

Station Replicate	SB2+12			Pooled	Mean	Std Dev
	A	B	C			
Total Abundance	2	4	7	13	4.33	2.517
Miscellaneous Abundance	0	1	0	1	0.33	0.577
Arthropoda Abundance	0	0	0	0	0.00	0.000
Annelida Abundance	2	3	7	12	4.00	2.646
Insecta Abundance	0	0	0	0	0.00	0.000
Total Number of Taxa	2	2	1	1.67	0.577	
Miscellaneous No. of Taxa	0	1	0	0.33	0.577	
Arthropoda No. of Taxa	0	0	0	0.00	0.000	
Annelida No. of Taxa	2	1	1	1.33	0.577	
Insecta No. of Taxa	0	0	0	0.00	0.000	

\*Half Moon Bay Intertidal MISCELLANEOUS abundance and taxa count includes:

CNIDARIA  
Campanulariidae Fragment  
Cnidaria Indet. Fragment  
Hydriida Indet. Fragment  
PLATYHELMINTHES  
Platyhelminthes Indet.  
Nemertea  
Nemertea Indet.  
Tetrastemma sp.  
ENTOPROCTA  
Barentsia sp. colony fragment  
Entoprocta colony fragment

**TABLE B-2**

**BIOMASS DATA BY REPLICATE**

**Table B-2. Biomass data by Replicate - Half Moon Bay and South Beach Stations**

Station	Rep	Weight in Grams			
		Miscellaneous	Mollusca	Crustacea	Polychaeta
HMB2+0	A	0.0012	0.0001	0.0007	0.0007
HMB2+0	B	0.0001	0.0004	0.0006	0.0003
HMB2+0	C	0.0023	0	0.0002	0.0002
HMB2+0	D	0.0009	0.0004	0.001	0.0028
HMB2+0	E	0	0	0	0.0002
HMB2+0	F	0.0015	0.0003	0.0037	0.0013
HMB2+0	G	0.0164	0.0002	0.0005	0.0007
HMB2+0	H	0.0016	0	0.0001	0.0019
HMB2+0	I	0.0017	0	0.0005	0.0033
HMB2+0	J	0.0032	0.0001	0.0014	0.0078
HMB2+4	A	0.001	0	0.0001	0.0005
HMB2+4	B	0.0012	0	0.0001	0.0004
HMB2+4	C	0.0002	0	0	0.0043
HMB3+0	A	0.0007	0	0.0009	0.0002
HMB3+0	B	0.0005	0	0	0.0075
HMB3+0	C	0.0003	0	0.0014	0.0028
HMB3+4	A	0.0017	0	0	0.0018
HMB3+4	B	0.0018	0	0	0
HMB3+4	C	0.0009	0	0	0.0003
HMB3+8	A	0.0021	0	0	0
HMB3+8	B	0.0003	0	0.0001	0
HMB3+8	C	0.0006	0	0	0
HMB4+0	A	0.0007	0	0	0
HMB4+0	B	0.0005	0	0	0.0006
HMB4+0	C	0.0015	0	0	0.0004
HMB4+4	A	0.0009	0	0	0.0137
HMB4+4	B	0.0018	0	0	0.0259
HMB4+4	C	0.0007	0	0	0.005
HMB4+8	A	0.0002	0	0	0
HMB4+8	B	0.0005	0	0	0
HMB4+8	C	0.0006	0	0	0
HMB4+8	D	0.0005	0	0	0
HMB4+8	E	0.0003	0	0	0
HMB4+8	F	0.0005	0	0	0
HMB4+8	G	0.0005	0	0	0
HMB4+8	H	0.0011	0	0	0
HMB4+8	I	0.0009	0	0	0
HMB4+8	J	0.0004	0	0	0
HMB4+12	A	0.0002	0	0	0
HMB4+12	B	0.0001	0	0	0.0003
HMB4+12	C	0	0	0	0
HMB5+0	A	0.0004	0	0	0
HMB5+0	B	0	0	0	0.0003
HMB5+0	C	0.0011	0	0.0001	0
HMB5+4	A	0.0006	0	0	0.0007
HMB5+4	B	0.0006	0	0	0.0004
HMB5+4	C	0.0004	0	0	0.0093
HMB5+8	A	0.0006	0	0	0
HMB5+8	B	0.0009	0	0	0
HMB5+8	C	0.0011	0	0	0
HMB5+12	A	0.0002	0	0	0
HMB5+12	B	0	0	0	0.0002
HMB5+12	C	0	0	0	0

Weight in Grams					
Station	Rep	Miscellaneous	Mollusca	Crustacea	Polychaeta
HMBsub1	A	0.0007	0.0003	0.0003	0.0025
HMBsub1	B	0.0014	0.0002	0.0003	0.054
HMBsub1	C	0.0005	0.0002	0.0001	0.0187
HMBsub2	A	0.001	0	0.0001	0.0025
HMBsub2	B	0.0009	0.0001	0.0001	0.0307
HMBsub2	C	0.0012	0.0003	0.0005	0.075
HMBsub3	A	0.0004	0	0.0043	0.0056
HMBsub3	B	0.0004	0.0001	0.0028	0.0019
HMBsub3	C	0.0004	0.0004	0.0003	0.0044
HMBsub4	A	0.0001	0.0022	0.0018	0.0058
HMBsub4	B	0.0003	0.0008	0.0025	0.0075
HMBsub4	C	0.0002	0.0005	0.0024	0.0021
HMBsub5	A	0.0021	0.039	0.0013	0.007
HMBsub5	B	0.0008	0.0269	0.0001	0.0169
HMBsub5	C	0.0014	0.0002	0.0003	0.0205
HMBsub6	A	0.0006	0	0.0014	0.011
HMBsub6	B	0.0022	0.0002	0.0007	0.0114
HMBsub6	C	0.00011	0	0.0001	0.0013
HMBsub7	A	0.0004	0.0002	0.0004	0.0006
HMBsub7	B	0.0002	0.0018	0.0009	0.009
HMBsub7	C	0.0006	0.0002	0.001	0.0131
HMBsub7	D	0.0428	0.0005	0.002	0.0357
HMBsub7	E	0.0004	0.0007	0.0017	0.0129
HMBsub7	F	0.0007	0.0002	0	0.0019
HMBsub7	G	0.0021	0.0003	0.0014	0.0029
HMBsub7	H	0.0005	0	0.0003	0.0037
HMBsub7	I	0.0007	0.0015	0.0067	0.0278
HMBsub7	J	0.0016	0.0002	0.0022	0.0041
HMBsub8	A	0.0037	0.0002	0	0.0089
HMBsub8	B	0.0019	0	0.0009	0.0036
HMBsub8	C	0.0051	0	0.0023	0.0069
SB1+0	A	0.0044	0	0	0
SB1+0	B	0.0034	0	0	0.0034
SB1+0	C	0.0052	0	0.0019	0.0029
SB1+4	A	0.0023	0	0	0.0042
SB1+4	B	0.0105	0	0	0.0716
SB1+4	C	0.0019	0	0.0007	0.0029
SB1+8	A	0.0042	0	0.0303	0.0003
SB1+8	B	0.0022	0	0.0307	0.0015
SB1+8	C	0.0018	0	0.0218	0.0003
SB1+12	A	0.0003	0	0	0
SB1+12	B	0.0009	0	0	0
SB1+12	C	0.0002	0	0	0
SB2+0	A	0.0021	0	0.0017	0.0014
SB2+0	B	0.0019	0	0.0007	0.0038
SB2+0	C	0	0	0	0
SB2+4	A	0.0005	0	0.0063	0.0055
SB2+4	B	0.0011	0	0.0064	0.0025
SB2+4	C	0.0056	0	0.0057	0.0036
SB2+8	A	0.0032	0	0.0385	0.0012
SB2+8	B	0.0009	0	0.0178	0.0006
SB2+8	C	0.0025	0	0.0242	0.5521
SB2+12	A	0.0001	0	0	0.001
SB2+12	B	0.0007	0	0	0
SB2+12	C	0.0006	0	0	0

**TABLE B-3**

**RAW BENTHIC INFAUNA ANALYSIS RESULTS**



Half Moon Bay Intertidal June 2004 Part 1

HMB INTERTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004
Time	725	725	725	725	725	725	725	725	725	725	725	725
Station	HMB2+0	HMB2+0	HMB2+0	HMB2+0	HMB2+0	HMB2+0	HMB2+0	HMB2+0	HMB2+0	HMB2+0	HMB2+0	HMB2+0
Replicate	C 1mm	C 1mm	C 0.5mm	C 0.5mm	C 0.25mm	C 0.25mm	D 1mm	D 1mm	D 0.5mm	D 0.5mm	D 0.25mm	D 0.25mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and	0.0006		0.0006		0.0011						0.0009
Mollusca weight (gm)*	juveniles											0.0004
Crustacea weight (gm)*	combined					0.0002						0.001
Polychaeta weight (gm)*					0.0002		0.0003		0.0009			0.0016
Nematoda (do not include in data)												133
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Juvenile
MISCELLANEOUS												
CNIDARIA												
Campulariidae Fragment	370401											1
Cnidaria Indet. Fragment	37											
Hydroida Indet. Fragment	3702											1
PLATYHELMINTHES												
Platyhelminthes Indet.	39											
Nemertea												
Nemertea Indet.	43					1		27				25
Tetrastemma sp.	43060602											
ENTOPROCTA												
Barentsia sp. colony fragment	79020102											
Entoprocta colony fragment	79						1					
MOLLUSCA												
Bivalvia												
Bivalvia Indet.	5515											10
Modiolus sp.	55070106											
ARTHROPODA												
Arachnida												
Acarina Indet.	5922											2
Crustacea												
Amphipoda Indet.	6169											
Balanidae Indet.	613402											
Caprellidae Indet.	617101											
Cirripedia Indet.	6134						1					
Decapoda fragment	6175											
Gammaridea Indet.	6169							1				
Eohaustorius washingtonianus	6169220101											
Harpacticoida Indet.	6119										21	2
Harpacticus sp.	61191001											7
Isopoda Indet.	6158											1
Ostracoda Indet.	6110											
Parametaphoxus quayleyi	6169420689											
Poecilostomatoida	613208											
Tisbe sp.	61191301											2
ANNELIDA												
Polychaeta												
Armandia brevis	5001580202											
Capitellidae Indet.	500160											
Eteone sp.	50011302											1
Euclymenina Indet.	5001631											
Eteone columbiensis												
Euzonus sp. 1	50015807											1
Glycinde armigera	5001280103								1		1	2
Magelona sacculata	5001440116											
Mediomastus sp.	50016004											1
Microphthalmus sp.	50012102											1
Nephtyidae Indet.	500125											1
Nephrys californiensis	5001250113											
Nereis sp.	50012501											
Ophelia limacina	5001580301										2	
Ophelia sp.	50015803											
Opheliidae Indet.	500158						2					4
Polychaeta Indet.	5001											
Scoloplos armiger	5001400301											
Spio butleri	5001430708											1
Spionidae Indet.	500143											
Oligochaeta	5004											
Oligochaeta Indet.	5004											
Canalipalpata												
Saccocirrus sp.	50020401											
ECTOPROCTA (BRYOZOA)												
Bowerbankia sp. colony fragment	78050102	1		1								
Bryozoa colony fragment	78					1						
Cheilostomata Indet. Fragment	7814											
INSECTA												
Chironomidae	6489600											
Diptera larvae	6501							1				
Insecta larvae Indet.	62							3				





Half Moon Bay Intertidal June 2004 Part 1

HMB INTERTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004
Time	725	725	725	725	725	725	725	725	725	725	725	725
Station	HMB2+0	HMB2+0	HMB2+0	HMB2+0	HMB2+0	HMB2+0	HMB2+0	HMB2+0	HMB2+0	HMB2+0	HMB2+0	HMB2+0
Replicate	I 1mm	I 1mm	I 0.5mm	I 0.5mm	I 0.25mm	I 0.25mm	J 1mm	J 1mm	J 0.5mm	J 0.5mm	J 0.25mm	J 0.25mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and	0.0012			0.0005		0.0006		0.0022		0.0004	
Mollusca weight (gm)*	juveniles										0.0001	
Crustacea weight (gm)*	combined				0.0005				0.0007		0.0007	
Polychaeta weight (gm)*		0.0023		0.0006		0.0004		0.0073		0.0003		0.0002
Nematoda (do not include in data)						49					57	
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult
MISCELLANEOUS												
CNIDARIA												
Campulariidae Fragment	370401	1								1		
Cnidaria Indet. Fragment	37											
Hydroida Indet. Fragment	3702										1	
PLATYHELMINTHES												
Platyhelminthes Indet.	39						1					
Nemertea												
Nemertea Indet.	43	1					11	1			3	
Tetrastemma sp.	43060602											
ENTOPROCTA												
Barentsia sp. colony fragment	79020102											
Entoprocta colony fragment	79											
MOLLUSCA												
Bivalvia												
Bivalvia Indet.	5515										1	
Modiolus sp.	55070106											
ARTHROPODA												
Arachnida												
Acarina Indet.	5922										1	
Crustacea												
Amphipoda Indet.	6169											
Balanidae Indet.	613402											
Caprellidae Indet.	617101											
Cirripedia Indet.	6134										3	
Decapoda fragment	6175									1		
Gammaridea Indet.	6169										3	
Eohaustorius washingtonianus	6169220101											
Harpacticoida Indet.	6119					5				4		
Harpacticus sp.	61191001					1						
Isopoda Indet.	6158											
Ostracoda Indet.	6110								1			
Parametaphoxus quayleyi	6169420689											
Poecilostomatoidea	613208					2						
Tisbe sp.	61191301											
ANNELIDA												
Polychaeta												
Armandia brevis	5001580202											
Capitellidae Indet.	500160		1									
Eteone sp.	50011302											
Euclymenina Indet.	5001631											
Eteone columbiensis												
Euzonus sp. 1	50015807											
Glycinde armigera	5001280103								1			
Magelona sacculata	5001440116						1					
Mediomastus sp.	50016004	1										
Microphthalmus sp.	50012102											
Nephtyidae Indet.	500125											
Nephtys californiensis	5001250113											
Nereis sp.	50012501											
Ophelia limacina	5001580301											
Ophelia sp.	50015803											
Opheliidae Indet.	500158					1				1		
Polychaeta Indet.	5001	1										
Scoloplos armiger	5001400301											
Spio butleri	5001430708						1					
Spionidae Indet.	500143											
Oligochaeta	5004											
Oligochaeta Indet.	5004											
Canalipalpata												
Saccocirrus sp.	50020401											
ECTOPROCTA (BRYOZOA)												
Bowerbankia sp. colony fragment	78050102											
Bryozoa colony fragment	78											
Cheilostomata Indet. Fragment	7814											
INSECTA												
Chironomidae	6489600											
Diptera larvae	6501											
Insecta larvae Indet.	62											

## Half Moon Bay Intertidal June 2004 Part 1

HMB INTERTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004
Time		750	750	750	750	750	750	750	750	750	750	750
Station		HMB 2+4	HMB 2+4	HMB 2+4	HMB 2+4	HMB 2+4	HMB 2+4	HMB 2+4	HMB 2+4	HMB 2+4	HMB 2+4	HMB 2+4
Replicate		A 1mm	A 1mm	A 0.5mm	A 0.5mm	A 0.25mm	A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.5mm	B 0.25mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and		0.0007		0.0003				0.001		0.0002	
Mollusca weight (gm)*	juveniles											
Crustacea weight (gm)*	combined					0.0001					0.0001	
Polychaeta weight (gm)*						0.0005					0.0004	
Nematoda (do not include in data)						36					54	
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult
MISCELLANEOUS												
CNIDARIA												
Campulariidae Fragment	370401											
Cnidaria Indet. Fragment	37											
Hydroida Indet. Fragment	3702											
PLATYHELMINTHES												
Platyhelminthes Indet.	39											
Nemertea												
Nemertea Indet.	43						10		2		5	
Tetrastemma sp.	43060602		1									
ENTOPROCTA												
Barentsia sp. colony fragment	79020102											
Entoprocta colony fragment	79											
MOLLUSCA												
Bivalvia												
Bivalvia Indet.	5515											
Modiolus sp.	55070106											
ARTHROPODA												
Arachnida												
Acarina Indet.	5922											
Crustacea												
Amphipoda Indet.	6169											
Balanidae Indet.	613402											
Caprellidae Indet.	617101											
Cirripedia Indet.	6134											
Decapoda fragment	6175											
Gammaridea Indet.	6169											
Eohaustorius washingtonianus	6169220101											
Harpacticoida Indet.	6119					1				1		
Harpacticus sp.	61191001											
Isopoda Indet.	6158											
Ostracoda Indet.	6110											
Parametaphoxus quayleyi	6169420689											
Poecilostomatoidea	613208											
Tisbe sp.	61191301											
ANNELIDA												
Polychaeta												
Armandia brevis	5001580202											
Capitellidae Indet.	500160											
Eteone sp.	50011302											
Euclymenina Indet.	5001631											
Eteone columbiensis												
Euzonus sp. 1	50015807											
Glycinde armigera	5001280103											
Magelona sacculata	5001440116											
Mediomastus sp.	50016004											
Microphthalmus sp.	50012102											
Nephtyidae Indet.	500125											
Nephtys californiensis	5001250113											
Nereis sp.	50012501											
Ophelia limacina	5001580301											
Ophelia sp.	50015803											
Opheliidae Indet.	500158					2						
Polychaeta Indet.	5001						1				1	
Scoloplos armiger	5001400301											2
Spio butleri	5001430708											
Spionidae Indet.	500143											
Oligochaeta	5004											
Oligochaeta Indet.	5004											
Canalipalpata												
Saccocirrus sp.	50020401					3					1	
ECTOPROCTA (BRYOZOA)												
Bowerbankia sp. colony fragment	78050102											
Bryozoa colony fragment	78											
Cheilostomata Indet. Fragment	7814											
INSECTA												
Chironomidae	6489600											
Diptera larvae	6501											
Insecta larvae Indet.	62											



## Half Moon Bay Intertidal June 2004 Part 1

HMB INTERTIDAL SAMPLES JUNE 2004													
Analyzed by Columbia Science													
Date	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004
Time	710	710	710	710	710	710	710	710	710	710	710	710	710
Station	HMB 3+0	HMB 3+0	HMB 3+0	HMB 3+0	HMB 3+0	HMB 3+0	HMB 3+0	HMB 3+0	HMB 3+0	HMB 3+0	HMB 3+0	HMB 3+0	HMB 3+0
Replicate	B 1mm	B 1mm	B 0.5mm	B 0.5mm	B 0.25mm	B 0.25mm	C 1mm	C 1mm	C 0.5mm	C 0.5mm	C 0.25mm	C 0.25mm	C 0.25mm
Echinoderm Weight (gm)*	*weights are												
Miscellaneous weight (gm)*	adults and				0.0005								0.0003
Mollusca weight (gm)*	juveniles												
Crustacea weight (gm)*	combined							0.0014					
Polychaeta weight (gm)*		0.0071				0.0004		0.0023			0.0004		0.0001
Nematoda (do not include in data)						2							16
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile
MISCELLANEOUS													
CNIDARIA													
Campanulariidae Fragment	370401												
Cnidaria Indet. Fragment	37												
Hydroida Indet. Fragment	3702												
PLATYHELMINTHES													
Platyhelminthes Indet.	39												
Nemertea													
Nemertea Indet.	43						14						12
Tetrastemma sp.	43060602												
ENTOPROCTA													
Barentsia sp. colony fragment	79020102												
Entoprocta colony fragment	79												
MOLLUSCA													
Bivalvia													
Bivalvia Indet.	5515												
Modiolus sp.	55070106												
ARTHROPODA													
Arachnida													
Acarina Indet.	5922												
Crustacea													
Amphipoda Indet.	6169												
Balanidae Indet.	613402												
Caprellidae Indet.	617101												
Cirripedia Indet.	6134												
Decapoda fragment	6175												
Gammaridea Indet.	6169												
Eohaustorius washingtonianus	6169220101							1	1				
Harpacticoida Indet.	6119												
Harpacticus sp.	61191001												
Isopoda Indet.	6158												
Ostracoda Indet.	6110												
Parametaphoxus quayleyi	6169420689												
Poecilostomatoida	613208												
Tisbe sp.	61191301												
ANNELIDA													
Polychaeta													
Armandia brevis	5001580202												
Capitellidae Indet.	500160												
Eteone sp.	50011302												
Euclymenina Indet.	5001631												
Eteone columbiensis													
Euzonus sp. 1	50015807												
Glycinde armigera	5001280103									1			
Magelona sacculata	5001440116												
Mediomastus sp.	50016004												
Microphthalmus sp.	50012102												
Nephtyidae Indet.	500125												
Nephrys californiensis	5001250113	3							1				
Nereis sp.	50012501												
Ophelia limacina	5001580301												
Ophelia sp.	50015803												
Opheliidae Indet.	500158												1
Polychaeta Indet.	5001						1						
Scoloplos armiger	5001400301												
Spio butleri	5001430708												
Spionidae Indet.	500143												
Oligochaeta	5004												
Oligochaeta Indet.	5004												
Canalipalpata													
Saccocirrus sp.	50020401												
ECTOPROCTA (BRYOZOA)													
Bowerbankia sp. colony fragment	78050102												
Bryozoa colony fragment	78												
Cheilostomata Indet. Fragment	7814												
INSECTA													
Chironomidae	6489600												
Diptera larvae	6501												
Insecta larvae Indet.	62												

HMB INTERTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004
Time		805	805	805	805	805	805	805	805	805	805	805
Station		HMB 3+4	HMB 3+4	HMB 3+4	HMB 3+4	HMB 3+4	HMB 3+4	HMB 3+4	HMB 3+4	HMB 3+4	HMB 3+4	HMB 3+4
Replicate		A 1mm	A 1mm	A 0.5mm	A 0.5mm	A 0.25mm	A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.5mm	B 0.25mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and					0.0017				0.0002		0.0016
Mollusca weight (gm)*	juveniles											
Crustacea weight (gm)*	combined											
Polychaeta weight (gm)*		0.0017				0.0001						
Nematoda (do not include in data)						9					10	
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult
MISCELLANEOUS												
CNIDARIA												
Campulariidae Fragment	370401											
Cnidaria Indet. Fragment	37											
Hydroida Indet. Fragment	3702											
PLATYHELMINTHES												
Platyhelminthes Indet.	39											
Nemertea												
Nemertea Indet.	43					23	24			1		45
Tetrastemma sp.	43060602											
ENTOPROCTA												
Barentsia sp. colony fragment	79020102											
Entoprocta colony fragment	79											
MOLLUSCA												
Bivalvia												
Bivalvia Indet.	5515											
Modiolus sp.	55070106											
ARTHROPODA												
Arachnida												
Acarina Indet.	5922											
Crustacea												
Amphipoda Indet.	6169											
Balanidae Indet.	613402											
Caprellidae Indet.	617101											
Cirripedia Indet.	6134											
Decapoda fragment	6175											
Gammaridea Indet.	6169											
Eohaustorius washingtonianus	6169220101											
Harpacticoida Indet.	6119											
Harpacticus sp.	61191001											
Isopoda Indet.	6158											
Ostracoda Indet.	6110											
Parametaphoxus quayleyi	6169420689											
Poecilostomatoidea	613208											
Tisbe sp.	61191301											
ANNELIDA												
Polychaeta												
Armandia brevis	5001580202											
Capitellidae Indet.	500160											
Eteone sp.	50011302											
Euelymenina Indet.	5001631											
Eteone columbiensis												
Euzonus sp. 1	50015807											
Glycinde armigera	5001280103											
Magelona sacculata	5001440116											
Mediomastus sp.	50016004											
Microphthalmus sp.	50012102											
Nephtyidae Indet.	500125											
Nephtys californiensis	5001250113											
Nereis sp.	50012501											
Ophelia limacina	5001580301											
Ophelia sp.	50015803											
Opheliidae Indet.	500158						1					
Polychaeta Indet.	5001	1										
Scoloplos armiger	5001400301											
Spio butleri	5001430708											
Spionidae Indet.	500143											
Oligochaeta	5004											
Oligochaeta Indet.	5004											
Canalipalpata												
Saccocirrus sp.	50020401											
ECTOPROCTA (BRYOZOA)												
Bowerbankia sp. colony fragment	78050102											
Bryozoa colony fragment	78											
Cheilostomata Indet. Fragment	7814											
INSECTA												
Chironomidae	6489600											
Diptera larvae	6501											
Insecta larvae Indet.	62											



## Half Moon Bay Intertidal June 2004 Part 1

HMB INTERTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550
Station	HMB 3+8	HMB 3+8	HMB 3+8	HMB 3+8	HMB 3+8	HMB 3+8	HMB 3+8	HMB 3+8	HMB 3+8	HMB 3+8	HMB 3+8	HMB 3+8
Replicate	B 1mm	B 1mm	B 0.5mm	B 0.5mm	B 0.25mm	B 0.25mm	C 1mm	C 1mm	C 0.5mm	C 0.5mm	C 0.25mm	C 0.25mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and				0.0003							0.0006
Mollusca weight (gm)*	juveniles											
Crustacea weight (gm)*	combined				0.0001							
Polychaeta weight (gm)*												
Nematoda (do not include in data)					245							264
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult
MISCELLANEOUS												
CNIDARIA												
Campanulariidae Fragment	370401											
Cnidaria Indet. Fragment	37											
Hydroida Indet. Fragment	3702											
PLATYHELMINTHES												
Platyhelminthes Indet.	39											
Nemertea												
Nemertea Indet.	43					12						2
Tetrastemma sp.	43060602											
ENTOPROCTA												
Barentsia sp. colony fragment	79020102											
Entoprocta colony fragment	79											
MOLLUSCA												
Bivalvia												
Bivalvia Indet.	5515											
Modiolus sp.	55070106											
ARTHROPODA												
Arachnida												
Acarina Indet.	5922											
Crustacea												
Amphipoda Indet.	6169											
Balanidae Indet.	613402											
Caprellidae Indet.	617101											
Cirripedia Indet.	6134					1						
Decapoda fragment	6175											
Gammaridea Indet.	6169											
Eohaustorius washingtonianus	6169220101											
Harpacticoida Indet.	6119											
Harpacticus sp.	61191001											
Isopoda Indet.	6158											
Ostracoda Indet.	6110											
Parametaphoxus quayleyi	6169420689											
Poecilostomatoida	613208											
Tisbe sp.	61191301											
ANNELIDA												
Polychaeta												
Armandia brevis	5001580202											
Capitellidae Indet.	500160											
Eteone sp.	50011302											
Euclymenina Indet.	5001631											
Eteone columbiensis												
Euzonus sp. 1	50015807											
Glycinde armigera	5001280103											
Magelona sacculata	5001440116											
Mediomastus sp.	50016004											
Microphthalmus sp.	50012102											
Nephtyidae Indet.	500125											
Nephthys californiensis	5001250113											
Nereis sp.	50012501											
Ophelia limacina	5001580301											
Ophelia sp.	50015803											
Opheliidae Indet.	500158											
Polychaeta Indet.	5001											
Scoloplos armiger	5001400301											
Spio butleri	5001430708											
Spionidae Indet.	500143											
Oligochaeta	5004											
Oligochaeta Indet.	5004										16	1
Canalipalpata												
Saccocirrus sp.	50020401											
ECTOPROCTA (BRYOZOA)												
Bowerbankia sp. colony fragment	78050102											
Bryozoa colony fragment	78											
Cheilostomata Indet. Fragment	7814											
INSECTA												
Chironomidae	6489600											
Diptera larvae	6501											
Insecta larvae Indet.	62											

HMB INTERTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004
Time	635	635	635	635	635	635	635	635	635	635	635	635
Station	HMB 4+0	HMB 4+0	HMB 4+0	HMB 4+0	HMB 4+0	HMB 4+0	HMB 4+0	HMB 4+0	HMB 4+0	HMB 4+0	HMB 4+0	HMB 4+0
Replicate	A 1mm	A 1mm	A 0.5mm	A 0.5mm	A 0.25mm	A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.5mm	B 0.25mm	B 0.25mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and					0.0007						0.0005
Mollusca weight (gm)*	juveniles											
Crustacea weight (gm)*	combined											
Polychaeta weight (gm)*							0.0006					
Nematoda (do not include in data)						7						4
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult
MISCELLANEOUS												
CNIDARIA												
Campulariidae Fragment	370401											
Cnidaria Indet. Fragment	37											
Hydroidea Indet. Fragment	3702											
PLATYHELMINTHES												
Platyhelminthes Indet.	39											
Nemertea												
Nemertea Indet.	43						6					5
Tetrastemma sp.	43060602											
ENTOPROCTA												
Barentsia sp. colony fragment	79020102											
Entoprocta colony fragment	79											
MOLLUSCA												
Bivalvia												
Bivalvia Indet.	5515											
Modiolus sp.	55070106											
ARTHROPODA												
Arachnida												
Acarina Indet.	5922											
Crustacea												
Amphipoda Indet.	6169											
Balanidae Indet.	613402											
Caprellidae Indet.	617101											
Cirripedia Indet.	6134											
Decapoda fragment	6175											
Gammaridea Indet.	6169											
Eohaustorius washingtonianus	6169220101											
Harpacticoida Indet.	6119											
Harpacticus sp.	61191001											
Isopoda Indet.	6158											
Ostracoda Indet.	6110											
Parametaphoxus quayleyi	6169420689											
Poecilostomatoida	613208											
Tisbe sp.	61191301											
ANNELIDA												
Polychaeta												
Armandia brevis	5001580202											
Capitellidae Indet.	500160											
Eteone sp.	50011302											
Euelymenina Indet.	5001631											
Eteone columbiensis							1					
Euzonus sp. 1	50015807											
Glycinde armigera	5001280103											
Magelona sacculata	5001440116											
Mediomastus sp.	50016004											
Microphthalmus sp.	50012102											
Nephtyidae Indet.	500125											
Nephtys californiensis	5001250113											
Nereis sp.	50012501											
Ophelia limacina	5001580301											
Ophelia sp.	50015803											
Opheliidae Indet.	500158											
Polychaeta Indet.	5001											
Scoloplos armiger	5001400301											
Spio butleri	5001430708											
Spionidae Indet.	500143											
Oligochaeta	5004											
Oligochaeta Indet.	5004						8					2
Canalipalpata												
Saccocirrus sp.	50020401											
ECTOPROCTA (BRYOZOA)												
Bowerbankia sp. colony fragment	78050102											
Bryozoa colony fragment	78											
Cheilostomata Indet. Fragment	7814											
INSECTA												
Chironomidae	6489600											
Diptera larvae	6501											
Insecta larva Indet.	62											

HMB INTERTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004
Time		635	635	635	635	635	635	815	815	815	815	815
Station		HMB 4+0	HMB 4+0	HMB 4+0	HMB 4+0	HMB 4+0	HMB 4+0	HMB 4+4	HMB 4+4	HMB 4+4	HMB 4+4	HMB 4+4
Replicate		C 1mm	C 1mm	C 0.5mm	C 0.5mm	C 0.25mm	C 0.25mm	A 1mm	A 1mm	A 0.5mm	A 0.5mm	A 0.25mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and		0.0009		0.0006					0.0009		
Mollusca weight (gm)*	juveniles											
Crustacea weight (gm)*	combined											
Polychaeta weight (gm)*					0.0004		0.0135			0.0002		
Nematoda (do not include in data)						1					8	
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult
MISCELLANEOUS												
CNIDARIA												
Campulariidae Fragment	370401											
Cnidaria Indet. Fragment	37											
Hydroida Indet. Fragment	3702											
PLATYHELMINTHES												
Platyhelminthes Indet.	39											
Nemertea												
Nemertea Indet.	43			4	2		3			1		7
Tetrastemma sp.	43060602											
ENTOPROCTA												
Barentsia sp. colony fragment	79020102											
Entoprocta colony fragment	79											
MOLLUSCA												
Bivalvia												
Bivalvia Indet.	5515											
Modiolus sp.	55070106											
ARTHROPODA												
Arachnida												
Acarina Indet.	5922											
Crustacea												
Amphipoda Indet.	6169											
Balanidae Indet.	613402											
Caprellidae Indet.	617101											
Cirripedia Indet.	6134											
Decapoda fragment	6175											
Gammaridea Indet.	6169											
Eohaustorius washingtonianus	6169220101											
Harpacticoida Indet.	6119											
Harpacticus sp.	61191001											
Isopoda Indet.	6158											
Ostracoda Indet.	6110											
Parametaphoxus quayleyi	6169420689											
Poecilostomatoida	613208											
Tisbe sp.	61191301											
ANNELIDA												
Polychaeta												
Armandia brevis	5001580202											
Capitellidae Indet.	500160											
Eteone sp.	50011302											
Euelymenina Indet.	5001631											
Eteone columbienensis												
Euzonus sp. 1	50015807						1					
Glycinde armigera	5001280103											
Magelona sacculata	5001440116											
Mediomastus sp.	50016004											
Microphthalmus sp.	50012102											
Nephtyidae Indet.	500125											
Nephthys californiensis	5001250113											
Nereis sp.	50012501											
Ophelia limacina	5001580301											
Ophelia sp.	50015803											
Opheliidae Indet.	500158					2						2
Polychaeta Indet.	5001											
Scoloplos armiger	5001400301											
Spio butleri	5001430708						1					
Spionidae Indet.	500143											
Oligochaeta	5004											
Oligochaeta Indet.	5004					6					3	
Canalipalpata												
Saccocirrus sp.	50020401											
ECTOPROCTA (BRYOZOA)												
Bowerbankia sp. colony fragment	78050102											
Bryozoa colony fragment	78											
Cheilostomata Indet. Fragment	7814											
INSECTA												
Chironomidae	6489600											
Diptera larvae	6501											
Insecta larvae Indet.	62											

## Half Moon Bay Intertidal June 2004 Part 1

HMB INTERTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004	1/7/2004
Time	815	815	815	815	815	815	815	815	815	815	815	815
Station	HMB 4+4	HMB 4+4	HMB 4+4	HMB 4+4	HMB 4+4	HMB 4+4	HMB 4+4	HMB 4+4	HMB 4+4	HMB 4+4	HMB 4+4	HMB 4+4
Replicate	B 1mm	B 1mm	B 0.5mm	B 0.5mm	B 0.25mm	B 0.25mm	C 1mm	C 1mm	C 0.5mm	C 0.5mm	C 0.25mm	C 0.25mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and		0.0001		0.0017				0.0002		0.0005	
Mollusca weight (gm)*	juveniles											
Crustacea weight (gm)*	combined											
Polychaeta weight (gm)*		0.0259						0.0046		0.0004		
Nematoda (do not include in data)					8						8	
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult
MISCELLANEOUS												
CNIDARIA												
Campulariidae Fragment	370401											
Cnidaria Indet. Fragment	37											
Hydroida Indet. Fragment	3702											
PLATYHELMINTHES												
Platyhelminthes Indet.	39											
Nemertea												
Nemertea Indet.	43						11			1		7
Tetrastemma sp.	43060602											
ENTOPROCTA												
Barentsia sp. colony fragment	79020102											
Entoprocta colony fragment	79											
MOLLUSCA												
Bivalvia												
Bivalvia Indet.	5515											
Modiolus sp.	55070106											
ARTHROPODA												
Arachnida												
Acarina Indet.	5922											
Crustacea												
Amphipoda Indet.	6169											
Balanidae Indet.	613402											
Caprellidae Indet.	617101											
Cirripedia Indet.	6134											
Decapoda fragment	6175											
Gammaridea Indet.	6169											
Eohaustorius washingtonianus	6169220101											
Harpacticoida Indet.	6119											
Harpacticus sp.	61191001											
Isopoda Indet.	6158											
Ostracoda Indet.	6110											
Parametaphoxus quayleyi	6169420689											
Poecilostomatoida	613208											
Tisbe sp.	61191301											
ANNELIDA												
Polychaeta												
Armandia brevis	5001580202											
Capitellidae Indet.	500160											
Eteone sp.	50011302											
Euclymenina Indet.	5001631											
Eteone columbiensis												
Euzonus sp. 1	50015807	1						1			1	
Glycinde armigera	5001280103											
Magelona sacculata	5001440116											
Mediomastus sp.	50016004											
Microphthalmus sp.	50012102											
Nephtyidae Indet.	500125											
Nephtys californiensis	5001250113											
Nereis sp.	50012501											
Ophelia limacina	5001580301											
Ophelia sp.	50015803											
Opheliidae Indet.	500158											
Polychaeta Indet.	5001	1										
Scoloplos armiger	5001400301											
Spio butleri	5001430708											
Spionidae Indet.	500143											
Oligochaeta	5004											
Oligochaeta Indet.	5004			1		7					3	
Canalipalpata												
Saccocirrus sp.	50020401											
ECTOPROCTA (BRYOZOA)												
Bowerbankia sp. colony fragment	78050102											
Bryozoa colony fragment	78											
Cheilostomata Indet. Fragment	7814											
INSECTA												
Chironomidae	6489600											
Diptera larvae	6501											
Insecta larvae Indet.	62											

Half Moon Bay Intertidal June 2004 Part 1

HMB INTERTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525
Station	HMB 4+8	HMB 4+8	HMB 4+8	HMB 4+8	HMB 4+8	HMB 4+8	HMB 4+8	HMB 4+8	HMB 4+8	HMB 4+8	HMB 4+8	HMB 4+8
Replicate	A 1mm	A 1mm	A 0.5mm	A 0.5mm	A 0.25mm	A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.5mm	B 0.25mm	B 0.25mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and					0.0002						0.0005
Mollusca weight (gm)*	juveniles											
Crustacea weight (gm)*	combined											
Polychaeta weight (gm)*												
Nematoda (do not include in data)					48						51	
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult
MISCELLANEOUS												
Cnidaria												
Campanulariidae Fragment	370401											
Cnidaria Indet. Fragment	37											
Hydroida Indet. Fragment	3702											
PLATYHELMINTHES												
Platyhelminthes Indet.	39											
Nemertea												
Nemertea Indet.	43						1					5
Tetrastemma sp.	43060602											
ENTOPROCTA												
Barentsia sp. colony fragment	79020102											
Entoprocta colony fragment	79											
MOLLUSCA												
Bivalvia												
Bivalvia Indet.	5515											
Modiolus sp.	55070106											
ARTHROPODA												
Arachnida												
Acarina Indet.	5922											
Crustacea												
Amphipoda Indet.	6169											
Balanidae Indet.	613402											
Caprellidae Indet.	617101											
Cirripedia Indet.	6134											
Decapoda fragment	6175											
Gammaridea Indet.	6169											
Eohaustorius washingtonianus	6169220101											
Harpacticoida Indet.	6119											
Harpacticus sp.	61191001											
Isopoda Indet.	6158											
Ostracoda Indet.	6110											
Parametaphoxus quayleyi	6169420689											
Poecilostomatoidea	613208											
Tisbe sp.	61191301											
ANNELIDA												
Polychaeta												
Armandia brevis	5001580202											
Capitellidae Indet.	500160											
Eteone sp.	50011302											
Euclymenina Indet.	5001631											
Eteone columbiensis												
Euzonus sp. 1	50015807											
Glycinde armigera	5001280103											
Magelona sacculata	5001440116											
Mediomastus sp.	50016004											
Microphthalmus sp.	50012102											
Nephtyidae Indet.	500125											
Nephtys californiensis	5001250113											
Nereis sp.	50012501											
Ophelia limacina	5001580301											
Ophelia sp.	50015803											
Opheliidae Indet.	500158											
Polychaeta Indet.	5001											
Scoloplos armiger	5001400301											
Spio butleri	5001430708											
Spionidae Indet.	500143											
Oligochaeta	5004											
Oligochaeta Indet.	5004					1						2
Canalipalpata												
Saccocirrus sp.	50020401											
ECTOPROCTA (BRYOZOA)												
Bowerbankia sp. colony fragment	78050102											
Bryozoa colony fragment	78											
Cheilostomata Indet. Fragment	7814											
INSECTA												
Chironomidae	6489600											
Diptera larvae	6501											
Insecta larvae Indet.	62											











HMB INTERTIDAL SAMPLES JUNE 2004							
Analyzed by Columbia Science							
Date	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time		1535	1535	1535	1535	1535	1535
Station	HMB 4+12	HMB 4+12	HMB 4+12	HMB 4+12	HMB 4+12	HMB 4+12	HMB 4+12
Replicate	C 1mm	C 1mm	C 0.5mm	C 0.5mm	C 0.25mm	C 0.25mm	
Echinoderm Weight (gm)*	*weights are						
Miscellaneous weight (gm)*	adults and						
Mollusca weight (gm)*	juveniles						
Crustacea weight (gm)*	combined						
Polychaeta weight (gm)*							
Nematoda (do not include in data)							
Taxa	NODC Code	Number	Number	Number	Number	Number	Number
		Adult	Juvenile	Adult	Juvenile	Adult	Juvenile
MISCELLANEOUS							
CNIDARIA							
Campulariidae Fragment	370401						
Cnidaria Indet. Fragment	37						
Hydroida Indet. Fragment	3702						
PLATYHELMINTHES							
Platyhelminthes Indet.	39						
Nemertea							
Nemertea Indet.	43						
Tetrastemma sp.	43060602						
ENTOPROCTA							
Barentsia sp. colony fragment	79020102						
Entoprocta colony fragment	79						
MOLLUSCA							
Bivalvia							
Bivalvia Indet.	5515						
Modiolus sp.	55070106						
ARTHROPODA							
Arachnida							
Acarina Indet.	5922						
Crustacea							
Amphipoda Indet.	6169						
Balanidae Indet.	613402						
Caprellidae Indet.	617101						
Cirripedia Indet.	6134						
Decapoda fragment	6175						
Gammaridea Indet.	6169						
Eohaustorius washingtonianus	6169220101						
Harpacticoida Indet.	6119						
Harpacticus sp.	61191001						
Isopoda Indet.	6158						
Ostracoda Indet.	6110						
Parametaphoxus quayleyi	6169420689						
Poecilostomatoida	613208						
Tisbe sp.	61191301						
ANNELIDA							
Polychaeta							
Armandia brevis	5001580202						
Capitellidae Indet.	500160						
Eteone sp.	50011302						
Euclymenina Indet.	5001631						
Eteone columbiensis							
Euzonus sp. 1	50015807						
Glycinde armigera	5001280103						
Magelona sacculata	5001440116						
Mediomastus sp.	50016004						
Microphthalmus sp.	50012102						
Nephtyidae Indet.	500125						
Nephthys californiensis	5001250113						
Nereis sp.	50012501						
Ophelia limacina	5001580301						
Ophelia sp.	50015803						
Opheliidae Indet.	500158						
Polychaeta Indet.	5001						
Scoloplos armiger	5001400301						
Spio butleri	5001430708						
Spionidae Indet.	500143						
Oligochaeta	5004						
Oligochaeta Indet.	5004						
Canalipalpata							
Saccocirrus sp.	50020401						
ECTOPROCTA (BRYOZOA)							
Bowerbankia sp. colony fragment	78050102						
Bryozoa colony fragment	78						
Cheilostomata Indet. Fragment	7814						
INSECTA							
Chironomidae	6489600						
Diptera larvae	6501						
Insecta larvae Indet.	62						







## Half Moon Bay Intertidal June 2004 Part 2

HMB INTERTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450
Station	HMB 5+8	HMB 5+8	HMB 5+8	HMB 5+8	HMB 5+8	HMB 5+8	HMB 5+8	HMB 5+8	HMB 5+8	HMB 5+8	HMB 5+8	HMB 5+8
Replicate	A 1mm	A 1mm	A 0.5mm	A 0.5mm	A 0.25mm	A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.5mm	B 0.25mm	B 0.25mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and				0.0006				0.0001		0.0008	
Mollusca weight (gm)*	juveniles											
Crustacea weight (gm)*	combined											
Polychaeta weight (gm)*												
Nematoda (do not include in data)					260						243	
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult
MISCELLANEOUS												
CNIDARIA												
Campulariidae Fragment	370401											
Cnidaria Indet. Fragment	37											
Hydroids Indet. Fragment	3702											
PLATYHELMINTHES												
Platyhelminthes Indet.	39											
Nemertea												
Nemertea Indet.	43					13			1		14	
Tetrastemma sp.												
ENTOPROCTA												
Barentia sp. colony fragment	79020102											
Entoprocta colony fragment	79											
MOLLUSCA												
Bivalvia												
Bivalvia Indet.	5515											
Modiolus sp.	55070106											
ARTHROPODA												
Arachnida												
Acarina Indet.	5922											
Crustacea												
Amphipoda Indet.	6169											
Balanidae Indet.	613402											
Caprellidae Indet.	617101											
Cirripedia Indet.	6134											
Decapoda fragment	6175											
Gammaridea Indet.	6169											
Eohaustorius washingtonianus	6169220101											
Harpacticoida Indet.	6119											
Harpacticus sp.	61191001											
Isopoda Indet.	6158											
Ostracoda Indet.	6110											
Parametaphoxus quayleyi	6169420689											
Poecilostomatoidea	613208											
Tisbe sp.	61191301											
ANNELIDA												
Polychaeta												
Armandia brevis	5001580202											
Capitellidae Indet.	500160											
Eteone sp.	50011302											
Euclymeninae Indet.	5001631											
Eteone columbiensis												
Euzonus sp. 1	50015807											
Glycinde armigera	5001280103											
Magelona sacculata	5001440116											
Mediomastus sp.	50016004											
Microphthalmus sp.	50012102											
Nephtyidae Indet.	500125											
Nephtys californiensis	5001250113											
Nereis sp.	50012501											
Ophelia limacina	5001580301											
Ophelia sp.	50015803											
Opheliidae Indet.	500158											
Polychaeta Indet.	5001											
Scoloplos armiger	5001400301											
Spio butleri	5001430708											
Spiophoniidae Indet.	500143											
Oligochaeta	5004											
Oligochaeta Indet.	5004					1				3		
Canalipalpata	5002											
Saccocirrus sp.	50020401											
ECTOPROCTA (BRYOZOA)												
Bowerbankia sp. colony fragment	78050102											
Bryozoa colony fragment	78											
Cheilostomata Indet. Fragment	7814											
INSECTA												
Chironomidae	6489600											
Diptera larvae	6501											
Insecta larvae Indet.	62											

HMB INTERTIDAL SAMPLES JUNE 2004											
Analyzed by Columbia Science											
Date	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time	1450	1450	1450	1450	1450	1450	1505	1505	1505	1505	1505
Station	HMB 5+8	HMB 5+8	HMB 5+8	HMB 5+8	HMB 5+8	HMB 5+8	HMB 5+12	HMB 5+12	HMB 5+12	HMB 5+12	HMB 5+12
Replicate	C 1mm	C 1mm	C 0.5mm	C 0.5mm	C 0.25mm	C 0.25mm	A 1mm	A 1mm	A 0.5mm	A 0.5mm	A 0.25mm
Echinoderm Weight (gm)*	*weights are										
Miscellaneous weight (gm)*	adults and				0.0011						0.0002
Mollusca weight (gm)*	juveniles										
Crustacea weight (gm)*	combined										
Polychaeta weight (gm)*											
Nematoda (do not include in data)					293						18
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile
MISCELLANEOUS											
CNIDARIA											
Campulariidae Fragment	370401										
Cnidaria Indet. Fragment	37										
Hydroids Indet. Fragment	3702										
PLATYHELMINTHES											
Platyhelminthes Indet.	39										
Nemertea											
Nemertea Indet.	43					5					
Tetrastemma sp.											
ENTOPROCTA											
Barentia sp. colony fragment	79020102										
Entoprocta colony fragment	79										
MOLLUSCA											
Bivalvia											
Bivalvia Indet.	5515										
Modiolus sp.	55070106										
ARTHROPODA											
Arachnida											
Acarina Indet.	5922										
Crustacea											
Amphipoda Indet.	6169										
Balanidae Indet.	613402										
Caprellidae Indet.	617101										
Cirripedia Indet.	6134										
Decapoda fragment	6175										
Gammaridea Indet.	6169										
Eohaustorius washingtonianus	6169220101										
Harpacticoida Indet.	6119										
Harpacticus sp.	61191001										
Isopoda Indet.	6158										
Ostracoda Indet.	6110										
Parametaphoxus quayleyi	6169420689										
Poecilosomatoida	613208										
Tisbe sp.	61191301										
ANNELIDA											
Polychaeta											
Armandia brevis	5001580202										
Capitellidae Indet.	500160										
Eteone sp.	50011302										
Euclymeninae Indet.	5001631										
Eteone columbiensis											
Euzonus sp. 1	50015807										
Glycinde arnigera	5001280103										
Magelona sacculata	5001440116										
Mediomastus sp.	50016004										
Microphthalmus sp.	50012102										
Nephtyidae Indet.	500125										
Nephrys californiensis	5001250113										
Nereis sp.	50012501										
Ophelia limacina	5001580301										
Ophelia sp.	50015803										
Opheliidae Indet.	500158										
Polychaeta Indet.	5001										
Scoloplos armiger	5001400301										
Spio butleri	5001430708										
Spiophoridae Indet.	500143										
Oligochaeta	5004					5					1
Oligochaeta Indet.	5004										
Canalipalpata	5002										
Saccocirrus sp.	50020401										
ECTOPROCTA (BRYOZOA)											
Bowerbankia sp. colony fragment	78050102										
Bryozoa colony fragment	78										
Cheilostomata Indet. Fragment	7814										
INSECTA											
Chironomidae	6489600										
Diptera larvae	6501										
Insecta larvae Indet.	62										

HMB INTERTIDAL SAMPLES JUNE 2004											
Analyzed by Columbia Science											
Date	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time	1505	1505	1505	1505	1505	1505	1505	1505	1505	1505	1505
Station	HMB 5+12	HMB 5+12	HMB 5+12	HMB 5+12	HMB 5+12	HMB 5+12	HMB 5+12	HMB 5+12	HMB 5+12	HMB 5+12	HMB 5+12
Replicate	B 1mm	B 1mm	B 0.5mm	B 0.5mm	B 0.25mm	B 0.25mm	C 1mm	C 1mm	C 0.5mm	C 0.5mm	C 0.25mm
Echinoderm Weight (gm)*	*weights are										
Miscellaneous weight (gm)*	adults and										
Mollusca weight (gm)*	juveniles										
Crustacea weight (gm)*	combined										
Polychaeta weight (gm)*			0.0002								
Nematoda (do not include in data)					5						5
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile
MISCELLANEOUS											
CNIDARIA											
Campulariidae Fragment	370401										
Cnidaria Indet. Fragment	37										
Hydroids Indet. Fragment	3702										
PLATYHELMINTHES											
Platyhelminthes Indet.	39										
Nemertea											
Nemertea Indet.	43										
Tetrastemma sp.											
ENTOPROCTIA											
Barentia sp. colony fragment	79020102										
Entoprocta colony fragment	79										
MOLLUSCA											
Bivalvia											
Bivalvia Indet.	5515										
Modiolus sp.	55070106										
ARTHROPODA											
Arachnida											
Acarina Indet.	5922										
Crustacea											
Amphipoda Indet.	6169										
Balanidae Indet.	613402										
Caprellidae Indet.	617101										
Cirripedia Indet.	6134										
Decapoda fragment	6175										
Gammaridea Indet.	6169										
Eohaustorius washingtonianus	6169220101										
Harpacticoida Indet.	6119										
Harpacticus sp.	61191001										
Isopoda Indet.	6158										
Ostracoda Indet.	6110										
Parametaphoxus quayleyi	6169420689										
Poecilostomatoidea	613208										
Tisbe sp.	61191301										
ANNELIDA											
Polychaeta											
Armandia brevis	5001580202										
Capitellidae Indet.	500160										
Eteone sp.	50011302										
Euelymeninae Indet.	5001631										
Eteone columbiensis											
Euzonus sp. 1	50015807										
Glycinde armigera	5001280103										
Magelona sacculata	5001440116										
Mediomastus sp.	50016004										
Microphthalmus sp.	50012102										
Nephtyidae Indet.	500125										
Nephrys californiensis	5001250113										
Nereis sp.	50012501										
Ophelia limacina	5001580301										
Ophelia sp.	50015803										
Opheliidae Indet.	500158										
Polychaeta Indet.	5001										
Scoloplos armiger	5001400301										
Spio butleri	5001430708		1								
Spionidae Indet.	500143										
Oligochaeta	5004										
Oligochaeta Indet.	5004										
Canalipalpata	5002										
Saccocirrus sp.	50020401										
ECTOPROCTA (BRYOZOA)											
Bowerbankia sp. colony fragment	78050102										
Bryozoa colony fragment	78										
Cheilostomata Indet. Fragment	7814										
INSECTA											
Chironomidae	6489600										
Diptera larvae	6501										
Insecta larvae Indet.	62										

## Half Moon Bay Subtidal June 2004

HMB SUBTIDAL SAMPLES JUNE 2004											
Analyzed by Columbia Science											
Date		6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time		1125	1125	1125	1125	1125	1125	1125	1125	1125	1125
Station		HMB Sub I	HMB Sub I	HMB Sub I	HMB Sub I	HMB Sub I	HMB Sub I	HMB Sub I	HMB Sub I	HMB Sub I	HMB Sub I
Replicate		A 1mm	A 1mm	A 0.5mm	A 0.5mm	A 0.25mm	A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.25mm
Echinoderm Weight (gm)*	*weights are										
Miscellaneous weight (gm)*	adults and					0.0007	0.0011				0.0003
Mollusca weight (gm)*	juveniles					0.0003					0.0002
Crustacea weight (gm)*	combined					0.0003					0.0003
Polychaeta weight (gm)*		0.0016				0.0009	0.0531		0.0003		0.0006
Nematoda (do not include in data)						263			54		796
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile
MISCELLANEOUS											
Platyhelminthes											
Platyhelminthes Indet.		39									
Nemertea											
Nemertea Indet.		43					7	1			
MOLLUSCA											
Bivalvia											
Bivalvia Indet.		5515					3				
Siliqua patula	5515290101										
Tellina nuculoides	5515310202										
Tellinidae Indet.	551531										
Gastropoda											
Gastropoda Indet.		51									
ARTHROPODA											
Arachnida											
Acarina Indet.		5922									
Crustacea											
Balanidae Indet.		616937									
Coprophoidea Indet.		616915									
Eohaustorius brevicuspis											
Eohaustorius washingtonianus		6169220101									
Gammaridea Indet.		616922									
Harpacticoida Indet.		6119				5					9
Harpacticus sp.		61191001									
Lampropidae Indet.		615401									
Mandibulophoxus mayi											
Ostracoda Indet.		6110									
Pacifoculodes spinipes		6169370822									
Protomedieia sp.		61692603									
Rhepoxyinius boreovariatus											
Tisbe sp.		61191301									
Zaus sp.		61191002									
ANNELIDA											
Polychaeta											
Amastigus acutus											
Armandia brevis		5001580202									
Chaetozone bansei											
Cirratulidae Indet.		500150									
Eteone sp.		50011302									
Euzonus sp. 1		50015807									
Glycera macrobranchia		5001270110					1				
Glycinde armigera		5001280103					1				1
Glycera sp.		50012801									
Heteropodarke heteromorpha		5001211101									
Magelona sacculata		5001440116									
Mediomastus sp.		50016004				2					
Microphthalmus sp.		50012102									
Nephrys californiensis		5001250113	1								
Ophelia limacina		5001580301									
Ophelia sp.		50015803									
Opheliidae Indet.		500158				11					
Paleanotus bellis		5001080101									
Parsonidae Indet.		500141									
Phyllodocidae Indet.		500113									
Polychaeta Indet.		5001									
Scoloplos armiger		5001400301									
Spio butleri		5001430703									
Spio sp.		50014307									
Spionidae Indet.		500143									
Spiophanes bombyx		5001431001									
Syllidae Indet.		500143									
Terebellidae Indet.		500168									
Oligochaeta		5004									
Oligochaeta Indet.		5004					2				
Marionina sp.		5004									
Canalipalpata											
Saccocirrus sp.		50020401	1					1			
INSECTA											
Insecta Indet. Larvae		62									

HMB SUBTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time		1125	1125	1125	1125	1125	1125	1125	955	955	955	955
Station		HMB Sub 1	HMB Sub 1	HMB Sub 1	HMB Sub 1	HMB Sub 1	HMB Sub 1	HMB Sub 2	HMB Sub 2	HMB Sub 2	HMB Sub 2	HMB Sub 2
Replicate		B 0.25mm	C 1mm	C 1mm	C 0.5mm	C 0.5mm	C 0.25mm	C 0.25mm	A 1mm	A 1mm	A 0.5mm	A 0.5mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and					0.0005				0.0004		0.0006
Mollusca weight (gm)*	juveniles					0.0002						
Crustacea weight (gm)*	combined					0.0001						0.0001
Polychaeta weight (gm)*			0.0161		0.002		0.0006			0.0009		0.0016
Nematoda (do not include in data)					2		203					357
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Platyhelminthes												
Platyhelminthes Indet.		39										
Nemertea												
Nemertea Indet.		43	9					12			1	
MOLLUSCA												
Bivalvia												
Bivalvia Indet.		5515	1					2				
Siliqua patula		5515290101										
Tellina nuculoides		5515310202										
Tellinidae Indet.		551531										
Gastropoda												
Gastropoda Indet.		51										
ARTHROPODA												
Arachnida												
Acarina Indet.		5922										
Crustacea												
Balanidae Indet.		616937										
Coprophoidea Indet.		616915										
Eohaustorius brevicuspis												
Eohaustorius washingtonianus		6169220101										2
Gammaridea Indet.		616922										
Harpacticoida Indet.		6119					2					
Harpacticus sp.		61191001										
Lampropidae Indet.		615401										
Mandibulophoxus mayi												
Ostracoda Indet.		6110										
Pacifoculodes spinipes		6169370822										
Protomedieia sp.		61692603										
Rhepoxyinius boreovariatus												
Tisbe sp.		61191301										
Zaus sp.		61191002										
ANNELIDA												
Polychaeta												
Amastigos acutus												
Armandia brevis		5001580202										
Chaetozone bansei												
Cirratulidae Indet.		500150										
Eteone sp.		50011302										
Euzonus sp. 1		50015807										
Glycera macrobranchia		5001270110										
Glycinde armigera		5001280103	2	2	1	1	1					
Glycera sp.		50012801										
Heteropodarke heteromorpha		5001211101										
Magelona sacculata		5001440116										
Mediomastus sp.		50016004	1									
Microphthalmus sp.		50012102										
Nephrys californiensis		5001250113		1								
Ophelia limacina		5001580301				4	4					1
Ophelia sp.		50015803										
Opheliidae Indet.		500158	6				13					
Paleanotus bellis		5001080101										
Paronidae Indet.		500141										
Phyllocoelidae Indet.		500113										
Polychaeta Indet.		5001										
Scoloplos armiger		5001400301										
Spio butleri		5001430703										
Spio sp.		50014307										
Spionidae Indet.		500143										
Spiophanes bombyx		5001431001										
Syllidae Indet.		500143										
Terebellidae Indet.		500168										
Oligochaeta		5004										
Oligochaeta Indet.		5004				2						4
Marionina sp.		5004										
Canalipalpata												
Saccocirrus sp.		50020401										
INSECTA												
Insecta Indet. Larvae		62										

## Half Moon Bay Subtidal June 2004

HMB SUBTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time		955	955	955	955	955	955	955	955	955	955	955
Station		HMB Sub 2	HMB Sub 2	HMB Sub 2	HMB Sub 2	HMB Sub 2	HMB Sub 2	HMB Sub 2	HMB Sub 2	HMB Sub 2	HMB Sub 2	HMB Sub 2
Replicate		A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.5mm	B 0.25mm	B 0.25mm	C 1mm	C 1mm	C 0.5mm	C 0.5mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and				0.0002		0.0007					0.0012
Mollusca weight (gm)*	juveniles						0.0001					0.0003
Crustacea weight (gm)*	combined						0.0001					0.0005
Polychaeta weight (gm)*			0.0282		0.0019		0.0006		0.0708			0.0042
Nematoda (do not include in data)						278				2		356
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Platyhelminthes												
Platyhelminthes Indet.		39										
Nemertea												
Nemertea Indet.		43	8		1			24				
MOLLUSCA												
Bivalvia												
Bivalvia Indet.		5515						1				
Siliqua patula		5515290101										
Tellina nuculoides		5515310202										
Tellinidae Indet.		551531										
Gastropoda												
Gastropoda Indet.		51										
ARTHROPODA												
Arachnida												
Acarina Indet.		5922										
Crustacea												
Balanidae Indet.		616937										
Coprophoidea Indet.		616915										
Eohaustorius brevicuspis												
Eohaustorius washingtonianus		6169220101										
Gammaridea Indet.		616922										
Harpacticoida Indet.		6119					2					7
Harpacticus sp.		61191001										
Lampropidae Indet.		615401										
Mandibulophoxus mayi												
Ostracoda Indet.		6110										3
Pacifoculodes spinipes		6169370822										
Protomediea sp.		61692603										
Rhepoxyinius boreovariatus												
Tisbe sp.		61191301										
Zaus sp.		61191002										
ANNELIDA												
Polychaeta												
Amastigos acutus												
Armandia brevis		5001580202										
Chaetozone bansei												
Cirratulidae Indet.		500150										
Eteone sp.		50011302										
Euzonus sp. 1		50015807										
Glycera macrobranchia		5001270110										
Glycinde armigera		5001280103										
Glycera sp.		50012801										
Heteropodarke heteromorpha		5001211101				1						
Magelona sacculata		5001440116										
Mediomastus sp.		50016004										
Microphthalmus sp.		50012102										
Nephrys californiensis		5001250113	1							1		
Ophelia limacina		5001580301	2									
Ophelia sp.		50015803										
Opheliidae Indet.		500158	5					1	1			
Paleanotus bellis		5001080101										
Paronidae Indet.		500141										
Phyllocoelidae Indet.		500113										
Polychaeta Indet.		5001										
Scoloplos armiger		5001400301										
Spi butleri		5001430703	5	1				3	2			
Spi sp.		50014307										
Spionidae Indet.		500143										
Spiophanes bombyx		5001431001										
Syllidae Indet.		500143	1									
Terebellidae Indet.		500168										
Oligochaeta		5004										
Oligochaeta Indet.		5004										
Marionina sp.		5004										
Canalipalpata												
Saccocirrus sp.		50020401	7				1					
INSECTA												
Insecta Indet. Larvae		62										

## Half Moon Bay Subtidal June 2004

HMB SUBTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time		955	1015	1015	1015	1015	1015	1015	1015	1015	1015	1015
Station		HMB Sub 2	HMB Sub 3	HMB Sub 3	HMB Sub 3	HMB Sub 3	HMB Sub 3	HMB Sub 3	HMB Sub 3	HMB Sub 3	HMB Sub 3	HMB Sub 3
Replicate		C 0.25mm	A 1mm	A 1mm	A 0.5mm	A 0.5mm	A 0.25mm	A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.5mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and						0.0004					0.0004
Mollusca weight (gm)*	juveniles											0.0001
Crustacea weight (gm)*	combined		0.0036		0.0007				0.0027			0.0001
Polychaeta weight (gm)*			0.0004				0.0052					0.0019
Nematoda (do not include in data)							191					205
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Platyhelminthes												
Platyhelminthes Indet.		39										
Nemertea												
Nemertea Indet.		43	19						8			
MOLLUSCA												
Bivalvia												
Bivalvia Indet.		5515	2									
Siliqua patula		5515290101										
Tellina nuculoides		5515310202										
Tellinidae Indet.		551531										
Gastropoda												
Gastropoda Indet.		51	1									
ARTHROPODA												
Arachnida												
Acarina Indet.		5922										
Crustacea												
Balanidae Indet.		616937										
Coprophoidea Indet.		616915										
Eohaustorius brevicuspis												
Eohaustorius washingtonianus		6169220101					1					
Gammaridea Indet.		616922										1
Harpacticoida Indet.		6119										
Harpacticus sp.		61191001										
Lampropidae Indet.		615401										
Mandibulophoxus mayi				2			2			2		1
Ostracoda Indet.		6110										
Pacifoculodes spinipes		6169370822	2									
Protomedieia sp.		61692603										
Rhepoxyinius boreovariatus												
Tisbe sp.		61191301										
Zaus sp.		61191002										
ANNELIDA												
Polychaeta												
Amastigos acutus												
Armandia brevis		5001580202										
Chaetozone bansei												
Cirratulidae Indet.		500150										
Eteone sp.		50011302										
Euzonus sp. 1		50015807										
Glycera macrobranchia		5001270110										
Glycinde armigera		5001280103										
Glycera sp.		50012801										
Heteropodarke heteromorpha		5001211101										
Magelona sacculata		5001440116										
Mediomastus sp.		50016004										
Microphthalmus sp.		50012102										
Nephrys californiensis		5001250113										
Ophelia limacina		5001580301										
Ophelia sp.		50015803		1								
Opheliidae Indet.		500158	10						1			
Paleanotus bellis		5001080101										
Paronidae Indet.		500141										
Phyllodocidae Indet.		500113										
Polychaeta Indet.		5001										
Scoloplos armiger		5001400301										
Spio butleri		5001430703	1									
Spio sp.		50014307										
Spionidae Indet.		500143										
Spiophanes bombyx		5001431001										
Syllidae Indet.		500143										
Terebellidae Indet.		500168										
Oligochaeta		5004										
Oligochaeta Indet.		5004										
Marionina sp.		5004										
Canalipalpata												
Saccocirrus sp.		50020401	23						254			
INSECTA												
Insecta Indet. Larvae		62										

## Half Moon Bay Subtidal June 2004

HMB SUBTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time		1015	1015	1015	1015	1015	1015	1035	1035	1035	1035	1035
Station		HMB Sub 3	HMB Sub 3	HMB Sub 3	HMB Sub 3	HMB Sub 3	HMB Sub 3	HMB Sub 4	HMB Sub 4	HMB Sub 4	HMB Sub 4	HMB Sub 4
Replicate		B 0.25mm	C 1mm	C 1mm	C 0.5mm	C 0.5mm	C 0.25mm	C 0.25mm	A 1mm	A 1mm	A 0.5mm	A 0.5mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and						0.0004					0.0001
Mollusca weight (gm)*	juveniles						0.0004		0.0016			0.0006
Crustacea weight (gm)*	combined				0.0003				0.0006		0.0001	0.0011
Polychaeta weight (gm)*			0.0029				0.0015		0.0013		0.0026	0.0019
Nematoda (do not include in data)							171		9		35	255
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Platyhelminthes												
Platyhelminthes Indet.		39										
Nemertea												
Nemertea Indet.		43	10					8				
MOLLUSCA												
Bivalvia												
Bivalvia Indet.		5515	1					3				
Siliqua patula		5515290101										
Tellina nuculoides		5515310202										
Tellinidae Indet.		551531						1				
Gastropoda												
Gastropoda Indet.		51										
ARTHROPODA												
Arachnida												
Acarina Indet.		5922										
Crustacea												
Balanidae Indet.		616937						2				
Coprophoidea Indet.		616915										
Eohaustorius brevicuspis												
Eohaustorius washingtonianus		6169220101										
Gammaridea Indet.		616922										
Harpacticoida Indet.		6119										29
Harpacticus sp.		61191001						1		1	1	8
Lampropidae Indet.		615401										
Mandibulophoxus mayi						1						
Ostracoda Indet.		6110										
Pacifoculodes spinipes		6169370822										
Protomedieia sp.		61692603										
Rhepoxyinius boreovariatus												
Tisbe sp.		61191301										3
Zaus sp.		61191002										3
ANNELIDA												
Polychaeta												
Amastigos acutus												
Armandia brevis		5001580202										
Chaetozone bansei												
Cirratulidae Indet.		500150						1				
Eteone sp.		50011302										
Euzonus sp. 1		50015807										
Glycera macrobranchia		5001270110										
Glycinde armigera		5001280103						1				
Glycera sp.		50012801										
Heteropodarke heteromorpha		5001211101										
Magelona sacculata		5001440116										
Mediomastus sp.		50016004										
Microphthalmus sp.		50012102										
Nephrys californiensis		5001250113	1									
Ophelia limacina		5001580301										
Ophelia sp.		50015803										
Opheliidae Indet.		500158	1					2		1		4
Paleanotus bellis		5001080101										
Paronidae Indet.		500141										
Phyllodocidae Indet.		500113										
Polychaeta Indet.		5001						1				
Scoloplos armiger		5001400301										
Spio butleri		5001430703										
Spio sp.		50014307										
Spionidae Indet.		500143										
Spiophanes bombyx		5001431001										
Syllidae Indet.		500143										
Terebellidae Indet.		500168										
Oligochaeta		5004										
Oligochaeta Indet.		5004										
Marionina sp.		5004										
Canalipalpata												
Saccocirrus sp.		50020401	96					93	4		9	2
INSECTA												5
Insecta Indet. Larvae		62										

## Half Moon Bay Subtidal June 2004

HMB SUBTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time		1035	1035	1035	1035	1035	1035	1035	1035	1035	1035	1035
Station		HMB Sub 4	HMB Sub 4	HMB Sub 4	HMB Sub 4	HMB Sub 4	HMB Sub 4	HMB Sub 4	HMB Sub 4	HMB Sub 4	HMB Sub 4	HMB Sub 4
Replicate		A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.5mm	B 0.25mm	B 0.25mm	C 1mm	C 1mm	C 0.5mm	C 0.5mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and											
Mollusca weight (gm)*	juveniles											
Crustacea weight (gm)*	combined											
Polychaeta weight (gm)*			0.0029		0.0034		0.0012		0.0002		0.0005	
Nematoda (do not include in data)			4		38		201		9		13	
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Platyhelminthes												
Platyhelminthes Indet.		39										
Nemertea												
Nemertea Indet.		43	1						4			
MOLLUSCA												
Bivalvia												
Bivalvia Indet.		5515	18						9			
Siliqua patula		5515290101										
Tellina nuculoides		5515310202										
Tellinidae Indet.		551531										
Gastropoda												
Gastropoda Indet.		51										
ARTHROPODA												
Arachnida												
Acarina Indet.		5922	2						4			
Crustacea												
Balanidae Indet.		616937										
Coprophoidea Indet.		616915	1									
Eohaustorius brevicuspis												
Eohaustorius washingtonianus		6169220101										
Gammaridea Indet.		616922										
Harpacticoida Indet.		6119	11					1				36
Harpacticus sp.		61191001						4		35		6
Lampropidae Indet.		615401	1									
Mandibulophoxus mayi												
Ostracoda Indet.		6110										
Pacifoculodes spinipes		6169370822										
Protomedieia sp.		61692603										
Rhepoxyinius boreovariatus												
Tisbe sp.		61191301										2
Zaus sp.		61191002							2			3
ANNELIDA												
Polychaeta												
Amastigos acutus												
Armandia brevis		5001580202			1							
Chaetozone bansei												
Cirratulidae Indet.		500150										
Eteone sp.		50011302										
Euzonus sp. 1		50015807										
Glycera macrobranchia		5001270110										
Glycinde armigera		5001280103						4		4		1
Glycera sp.		50012801										
Heteropodarke heteromorpha		5001211101										
Magelona sacculata		5001440116										
Mediomastus sp.		50016004										
Microphthalmus sp.		50012102										
Nephrys californiensis		5001250113										
Ophelia limacina		5001580301										
Ophelia sp.		50015803										
Opheliidae Indet.		500158	9					5		2		
Paleanotus bellis		5001080101										
Paronidae Indet.		500141										
Phyllodocidae Indet.		500113								1		
Polychaeta Indet.		5001										
Scoloplos armiger		5001400301										
Spio butleri		5001430703										
Spio sp.		50014307										
Spioniidae Indet.		500143										
Spiophanes bombyx		5001431001										
Syllidae Indet.		500143										
Terebellidae Indet.		500168	1									
Oligochaeta		5004										
Oligochaeta Indet.		5004										
Marionina sp.		5004										
Canalipalpata												
Saccocirrus sp.		50020401		4		8	3		5	1		1
INSECTA												7
Insecta Indet. Larvae		62										

Half Moon Bay Subtidal June 2004

HMB SUBTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time		1035	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050
Station		HMB Sub 4	HMB Sub 5	HMB Sub 5	HMB Sub 5	HMB Sub 5	HMB Sub 5	HMB Sub 5	HMB Sub 5	HMB Sub 5	HMB Sub 5	HMB Sub 5
Replicate		C 0.25mm	A 1mm	A 1mm	A 0.5mm	A 0.5mm	A 0.25mm	A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.5mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and					0.0021						0.0008
Mollusca weight (gm)*	juveniles		0.039					0.0268				0.0001
Crustacea weight (gm)*	combined		0.0013									0.0001
Polychaeta weight (gm)*			0.0019				0.0051		0.0144		0.0006	0.0019
Nematoda (do not include in data)		1				441						145
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Platyhelminthes												
Platyhelminthes Indet.		39										
Nemertea												
Nemertea Indet.		43	3					47				
MOLLUSCA												
Bivalvia												
Bivalvia Indet.		5515	5									
Siliqua patula		5515290101										1
Tellina nuculoides		5515310202		1								
Tellinidae Indet.		551531										
Gastropoda												
Gastropoda Indet.		51										
ARTHROPODA												
Arachnida												
Acarina Indet.		5922	10									
Crustacea												
Balanidae Indet.		616937	1									
Coprophoidea Indet.		616915										
Eohaustorius brevicuspis												
Eohaustorius washingtonianus		6169220101										
Gammaridea Indet.		616922	1									
Harpacticoida Indet.		6119										
Harpacticus sp.		61191001										
Lampropidae Indet.		615401	1									
Mandibulophoxus mayi			1									
Ostracoda Indet.		6110										
Pacifoculodes spinipes		6169370822										
Protomedieia sp.		61692603	1									
Rhepoxyinius boreovariatus												
Tisbe sp.		61191301										
Zaus sp.		61191002	1									
ANNELIDA												
Polychaeta												
Amastigos acutus												
Armandia brevis		5001580202										
Chaetozone bansei									1	1		
Cirratulidae Indet.		500150										
Eteone sp.		50011302										
Euzonus sp. 1		50015807										
Glycera macrobranchia		5001270110										
Glycinde armigera		5001280103	1									
Glycera sp.		50012801										
Heteropodarke heteromorpha		5001211101										
Magelona sacculata		5001440116										
Mediomastus sp.		50016004										
Microphthalmus sp.		50012102	1									
Nephrys californiensis		5001250113	1									
Ophelia limacina		5001580301										
Ophelia sp.		50015803										
Opheliidae Indet.		500158	14									
Paleanotus bellis		5001080101	1									
Paranoidae Indet.		500141										
Phyllocoelidae Indet.		500113										
Polychaeta Indet.		5001										
Scoloplos armiger		5001400301									1	
Spiro butleri		5001430703						1				1
Spiro sp.		50014307										
Spionidae Indet.		500143										
Spiophanes bombyx		5001431001										
Syllidae Indet.		500143										
Terebellidae Indet.		500168										
Oligochaeta		5004										
Oligochaeta Indet.		5004										
Marionina sp.		5004										
Canalipalpata												
Saccocirrus sp.		50020401	1					183				
INSECTA												
Insecta Indet. Larvae		62										

## Half Moon Bay Subtidal June 2004

HMB SUBTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time		1050	1050	1050	1050	1050	1050	1050	1115	1115	1115	1115
Station		HMB Sub 5	HMB Sub 5	HMB Sub 5	HMB Sub 5	HMB Sub 5	HMB Sub 5	HMB Sub 6	HMB Sub 6	HMB Sub 6	HMB Sub 6	HMB Sub 6
Replicate		B 0.25mm	C 1mm	C 1mm	C 0.5mm	C 0.5mm	C 0.25mm	A 1mm	A 1mm	A 0.5mm	A 0.5mm	A 0.25mm
Echinoderm Weight (gm)*	*weights are					0.0014				0.0002		0.0004
Miscellaneous weight (gm)*	adults and											
Mollusca weight (gm)*	juveniles				0.0002							
Crustacea weight (gm)*	combined				0.0003				0.0012			0.0002
Polychaeta weight (gm)*			0.0018		0.0006		0.0181		0.0093			0.0017
Nematoda (do not include in data)						405				3		276
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Platyhelminthes												
Platyhelminthes Indet.		39										
Nemertea												
Nemertea Indet.		43	11					26			1	
MOLLUSCA												
Bivalvia												
Bivalvia Indet.		5515	1			1						
Siliqua patula		5515290101										
Tellina nuculoides		5515310202										
Tellinidae Indet.		551531										
Gastropoda												
Gastropoda Indet.		51										
ARTHROPODA												
Arachnida												
Acarina Indet.		5922	1									
Crustacea												
Balanidae Indet.		616937										
Coprophoidea Indet.		616915										
Eohaustorius brevicuspis												
Eohaustorius washingtonianus		6169220101										
Gammaridea Indet.		616922										
Harpacticoida Indet.		6119										4
Harpacticus sp.		61191001										
Lampropidae Indet.		615401										
Mandibulophoxus mayi						1			1			
Ostracoda Indet.		6110										
Pacifoculodes spinipes		6169370822										
Protomedieia sp.		61692603										
Rhepoxyinius boreovariatus												
Tisbe sp.		61191301										
Zaus sp.		61191002										
ANNELIDA												
Polychaeta												
Amastigos acutus												
Armandia brevis		5001580202										
Chaetozone bansei												
Cirratulidae Indet.		500150										
Eteone sp.		50011302										
Euzonus sp. 1		50015807										
Glycera macrobranchia		5001270110										
Glycinde armigera		5001280103										
Glycera sp.		50012801										
Heteropodarke heteromorpha		5001211101										
Magelona sacculata		5001440116										
Mediomastus sp.		50016004										
Microphthalmus sp.		50012102										
Nephrys californiensis		5001250113							4			
Ophelia limacina		5001580301										
Ophelia sp.		50015803										
Opheliidae Indet.		500158										
Paleanotus bellis		5001080101										
Paronididae Indet.		500141										
Phyllocoelidae Indet.		500113										
Polychaeta Indet.		5001		1			1					
Scoloplos armiger		5001400301										
Spio butleri		5001430703				1			1			
Spio sp.		50014307										
Spionidae Indet.		500143										
Spiophanes bombyx		5001431001										
Syllidae Indet.		500143										
Terebellidae Indet.		500168										
Oligochaeta		5004										
Oligochaeta Indet.		5004										
Marionina sp.		5004										
Canalipalpata												
Saccocirrus sp.		50020401	81		1				496			
INSECTA												
Insecta Indet. Larvae		62										

## Half Moon Bay Subtidal June 2004

HMB SUBTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time		1115	1115	1115	1115	1115	1115	1115	1115	1115	1115	1115
Station		HMB Sub 6	HMB Sub 6	HMB Sub 6	HMB Sub 6	HMB Sub 6	HMB Sub 6	HMB Sub 6	HMB Sub 6	HMB Sub 6	HMB Sub 6	HMB Sub 6
Replicate		A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.5mm	B 0.25mm	B 0.25mm	C 1mm	C 1mm	C 0.5mm	C 0.5mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and				0.0004		0.0018				0.0002	0.0009
Mollusca weight (gm)*	juveniles						0.0002					
Crustacea weight (gm)*	combined			0.0003			0.0004					0.0001
Polychaeta weight (gm)*				0.0087		0.0006		0.0021		0.0004		0.0009
Nematoda (do not include in data)							167					128
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Platyhelminthes												
Platyhelminthes Indet.		39										
Nemertea												
Nemertea Indet.		43	8			1			23		1	1
MOLLUSCA												
Bivalvia												
Bivalvia Indet.		5515							3			
Siliqua patula		5515290101										
Tellina nuculoides		5515310202										
Tellinidae Indet.		551531										
Gastropoda												
Gastropoda Indet.		51										
ARTHROPODA												
Arachnida												
Acarina Indet.		5922										
Crustacea												
Balanidae Indet.		616937										
Coprophoidea Indet.		616915										
Eohaustorius brevicuspis												
Eohaustorius washingtonianus		6169220101										
Gammaridea Indet.		616922										
Harpacticoida Indet.		6119						8				2
Harpacticus sp.		61191001										
Lampropidae Indet.		615401										
Mandibulophoxus mayi				1								
Ostracoda Indet.		6110										
Pacifoculodes spinipes		6169370822										
Protomediea sp.		61692603										
Rhepoxyinius boreovariatus												
Tisbe sp.		61191301										
Zaus sp.		61191002										
ANNELIDA												
Polychaeta												
Amastigos acutus												
Armandia brevis		5001580202										
Chaetozone bansei												
Cirratulidae Indet.		500150										
Eteone sp.		50011302										
Euzonus sp. 1		50015807										
Glycera macrobranchia		5001270110										
Glycinde armigera		5001280103	2									
Glycera sp.		50012801										
Heteropodarke heteromorpha		5001211101										
Magelona sacculata		5001440116										
Mediomastus sp.		50016004										
Microphthalmus sp.		50012102										
Nephrys californiensis		5001250113	1	3				1				
Ophelia limacina		5001580301										
Ophelia sp.		50015803										
Opheliidae Indet.		500158	9					2		1		
Paleanotus bellis		5001080101										
Paronidae Indet.		500141										
Phyllocoelidae Indet.		500113										
Polychaeta Indet.		5001			1							
Scoloplos armiger		5001400301										
Spio butleri		5001430703	2					1				
Spio sp.		50014307										
Spionidae Indet.		500143										
Spiophanes bombyx		5001431001										
Syllidae Indet.		500143										
Terebellidae Indet.		500168										
Oligochaeta		5004										
Oligochaeta Indet.		5004										
Marionina sp.		5004						1				
Canalipalpata												
Saccocirrus sp.		50020401	9						15			
INSECTA												
Insecta Indet. Larvae		62										

## Half Moon Bay Subtidal June 2004

HMB SUBTIDAL SAMPLES JUNE 2004													
Analyzed by Columbia Science													
Date		6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time		1115	1145	1145	1145	1145	1145	1145	1145	1145	1145	1145	1145
Station		HMB Sub 6	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7
Replicate		C 0.25mm	A 1mm	A 1mm	A 0.5mm	A 0.5mm	A 0.25mm	A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.5mm	B 0.25mm
Echinoderm Weight (gm)*	*weights are												
Miscellaneous weight (gm)*	adults and		0.0002			0.0002							0.0002
Mollusca weight (gm)*	juveniles					0.0002		0.0014					0.0004
Crustacea weight (gm)*	combined						0.0004				0.0004		0.0005
Polychaeta weight (gm)*				0.0004			0.0002		0.0063		0.0013		0.0014
Nematoda (do not include in data)							1122				2		1088
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult
MISCELLANEOUS													
Platyhelminthes													
Platyhelminthes Indet.		39											
Nemertea													
Nemertea Indet.		43	21		1				3				
MOLLUSCA													
Bivalvia													
Bivalvia Indet.		5515							1	1			
Siliqua patula		5515290101											
Tellina nuculoides		5515310202											
Tellinidae Indet.		551531											
Gastropoda													
Gastropoda Indet.		51											
ARTHROPODA													
Arachnida													
Acarina Indet.		5922											
Crustacea													
Balanidae Indet.		616937											
Coprophoidea Indet.		616915											
Eohaustorius brevicuspis													
Eohaustorius washingtonianus		6169220101											
Gammareida Indet.		616922											
Harpacticoida Indet.		6119						9					11
Harpacticus sp.		61191001											
Lampropidae Indet.		615401											
Mandibulophoxus mayi													
Ostracoda Indet.		6110											
Pacifoculodes spinipes		6169370822											1
Protomediea sp.		61692603											
Rhepoxyinius boreovariatus													
Tisbe sp.		61191301											
Zaus sp.		61191002											
ANNELIDA													
Polychaeta													
Amastigos acutus										1			
Armandia brevis		5001580202											
Chaetozone bansei													
Cirratulidae Indet.		500150											
Eteone sp.		50011302											
Euzonus sp. 1		50015807											
Glycera macrobranchia		5001270110											
Glycinde armigera		5001280103	1										
Glycera sp.		50012801											
Heteropodarke heteromorpha		5001211101											
Magelona sacculata		5001440116											
Mediomastus sp.		50016004											
Microphthalmus sp.		50012102									2		3
Nephrys californiensis		5001250113											
Ophelia limacina		5001580301											
Ophelia sp.		50015803											
Opheliidae Indet.		500158	6										
Paleanotus bellis		5001080101											
Paranoidae Indet.		500141											
Phyllocoelidae Indet.		500113											
Polychaeta Indet.		5001											
Scoloplos armiger		5001400301							1				
Spiro butleri		5001430703	1	1	1						1		
Spiro sp.		50014307											
Spioniidae Indet.		500143											
Spiophanes bombyx		5001431001											
Syllidae Indet.		500143							1				
Terebellidae Indet.		500168											
Oligochaeta		5004											
Oligochaeta Indet.		5004											
Marionina sp.		5004											
Canalipalpata													
Saccocirrus sp.		50020401	5						1				
INSECTA													
Insecta Indet. Larvae		62											

HMB SUBTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time		1145	1145	1145	1145	1145	1145	1145	1145	1145	1145	1145
Station		HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7
Replicate		B 0.25mm	C 1mm	C 1mm	C 0.5mm	C 0.5mm	C 0.25mm	C 0.25mm	D 1mm	D 1mm	D 0.5mm	D 0.5mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and						0.0006		0.0423			0.0005
Mollusca weight (gm)*	juveniles						0.0002		0.0003			0.0002
Crustacea weight (gm)*	combined		0.0008				0.0002		0.0014		0.0002	0.0004
Polychaeta weight (gm)*			0.0116		0.001		0.0005		0.0319		0.0028	0.001
Nematoda (do not include in data)			2		1		831					663
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Platyhelminthes												
Platyhelminthes Indet.		39										
Nemertea												
Nemertea Indet.		43	3						16	2		
MOLLUSCA												
Bivalvia												
Bivalvia Indet.		5515	4						2			
Siliqua patula		5515290101										
Tellina nuculoides		5515310202										
Tellinidae Indet.		551531								1		
Gastropoda												
Gastropoda Indet.		51										
ARTHROPODA												
Arachnida												
Acarina Indet.		5922										
Crustacea												
Balanidae Indet.		616937										
Coprophoidea Indet.		616915										
Eohaustorius brevicuspis												
Eohaustorius washingtonianus		6169220101									1	
Gammaridea Indet.		616922										
Harpacticoida Indet.		6119						6				19
Harpacticus sp.		61191001										1
Lampropidae Indet.		615401										
Mandibulophoxus mayi			1						1			
Ostracoda Indet.		6110										
Pacifoculodes spinipes		6169370822							1			
Protomedieia sp.		61692603										
Rhepoxyinius boreovariatus												
Tisbe sp.		61191301										
Zaus sp.		61191002										
ANNELIDA												
Polychaeta												
Amastigos acutus												
Armandia brevis		5001580202										
Chaetozone bansei												
Cirratulidae Indet.		500150										
Eteone sp.		50011302										
Euzonus sp. 1		50015807										
Glycera macrobranchia		5001270110										
Glycinde armigera		5001280103										
Glycera sp.		50012801										
Heteropodarke heteromorpha		5001211101										
Magelona sacculata		5001440116	1									
Mediomastus sp.		50016004										
Microphthalmus sp.		50012102										
Nephrys californiensis		5001250113										
Ophelia limacina		5001580301							3			
Ophelia sp.		50015803					1					
Opheliidae Indet.		500158	8						5		4	1
Paleanotus bellis		5001080101										
Paronidae Indet.		500141										
Phyllodocidae Indet.		500113						1				
Polychaeta Indet.		5001										
Scoloplos armiger		5001400301										
Spio butleri		5001430703	3	1	2				2		2	1
Spio sp.		50014307										
Spionidae Indet.		500143										
Spiophanes bombyx		5001431001										
Syllidae Indet.		500143										
Terebellidae Indet.		500168										
Oligochaeta		5004										
Oligochaeta Indet.		5004										
Marionina sp.		5004					1					
Canalipalpata												
Saccocirrus sp.		50020401	8						1			
INSECTA												
Insecta Indet. Larvae		62										

## Half Moon Bay Subtidal June 2004

HMB SUBTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time		1145	1145	1145	1145	1145	1145	1145	1145	1145	1145	1145
Station		HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7
Replicate		D 0.25mm	E 1mm	E 1mm	E 0.5mm	E 0.5mm	E 0.25mm	E 0.25mm	F 1mm	F 1mm	F 0.5mm	F 0.5mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and							0.0004				0.0007
Mollusca weight (gm)*	juveniles					0.0006		0.0001				0.0002
Crustacea weight (gm)*	combined			0.0017								
Polychaeta weight (gm)*				0.0114		0.0003		0.0012			0.0008	0.0011
Nematoda (do not include in data)								2006				485
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Platyhelminthes												
Platyhelminthes Indet.		39										
Nemertea												
Nemertea Indet.		43	17						9			
MOLLUSCA												
Bivalvia												
Bivalvia Indet.		5515	2						1			
Siliqua patula		5515290101										
Tellina nuculoides		5515310202										
Tellinidae Indet.		551531					1					
Gastropoda												
Gastropoda Indet.		51										
ARTHROPODA												
Arachnida												
Acarina Indet.		5922										
Crustacea												
Balanidae Indet.		616937										
Coprophoidea Indet.		616915										
Eohaustorius brevicuspis												
Eohaustorius washingtonianus		6169220101										
Gammaridea Indet.		616922										
Harpacticoida Indet.		6119										
Harpacticus sp.		61191001										
Lampropidae Indet.		615401										
Mandibulophoxus mayi				1								
Ostracoda Indet.		6110										
Pacifoculodes spinipes		6169370822										
Protomedieia sp.		61692603										
Rhepoxyinius boreovariatus												
Tisbe sp.		61191301										
Zaus sp.		61191002										
ANNELIDA												
Polychaeta												
Amastigus acutus												
Armandia brevis		5001580202										
Chaetozone bansei												
Cirratulidae Indet.		500150										
Eteone sp.		50011302										
Euzonus sp. 1		50015807										
Glycera macrobranchia		5001270110										
Glycinde armigera		5001280103										
Glycera sp.		50012801										
Heteropodarke heteromorpha		5001211101										
Magelona sacculata		5001440116										
Mediomastus sp.		50016004										
Microphthalmus sp.		50012102										
Nephrys californiensis		5001250113										
Ophelia limacina		5001580301										
Ophelia sp.		50015803										
Opheliidae Indet.		500158	8						5			2
Paleanotus bellis		5001080101										
Paronidae Indet.		500141							1			
Phyllodocidae Indet.		500113										
Polychaeta Indet.		5001										
Scoloplos armiger		5001400301	1	1								
Spio butleri		5001430703	4	2		1						
Spio sp.		50014307										
Spionidae Indet.		500143							3			
Spiophanes bombyx		5001431001										
Syllidae Indet.		500143										
Terebellidae Indet.		500168										
Oligochaeta		5004										
Oligochaeta Indet.		5004										
Marionina sp.		5004										
Canalipalpata												
Saccocirrus sp.		50020401										
INSECTA												
Insecta Indet. Larvae		62										

## Half Moon Bay Subtidal June 2004

HMB SUBTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time		1145	1145	1145	1145	1145	1145	1145	1145	1145	1145	1145
Station		HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7
Replicate		F 0.25mm	G 1mm	G 1mm	G 0.5mm	G 0.5mm	G 0.25mm	G 0.25mm	H 1mm	H 1mm	H 0.5mm	H 0.5mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and	0.0016				0.0005						0.0005
Mollusca weight (gm)*	juveniles					0.0003						
Crustacea weight (gm)*	combined		0.0007			0.0007						0.0003
Polychaeta weight (gm)*			0.0016		0.0008		0.0005		0.0021		0.0005	0.0011
Nematoda (do not include in data)						1633				1		1272
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Platyhelminthes												
Platyhelminthes Indet.		39										
Nemertea												
Nemertea Indet.		43	12	1					5			
MOLLUSCA												
Bivalvia												
Bivalvia Indet.		5515	4						2			
Siliqua patula		5515290101										
Tellina nuculoides		5515310202										
Tellinidae Indet.		551531										
Gastropoda												
Gastropoda Indet.		51										
ARTHROPODA												
Arachnida												
Acarina Indet.		5922							1			
Crustacea												
Balanidae Indet.		616937										
Coprophoidea Indet.		616915										
Eohaustorius brevicuspis												
Eohaustorius washingtonianus		6169220101										
Gammaridea Indet.		616922										
Harpacticoida Indet.		6119						10	5			4
Harpacticus sp.		61191001										1
Lampropidae Indet.		615401										
Mandibulophoxus mayi			1									
Ostracoda Indet.		6110						1				
Pacifoculodes spinipes		6169370822										
Protomediea sp.		61692603										
Rhepoxyinius boreovariatus												
Tisbe sp.		61191301										
Zaus sp.		61191002										
ANNELIDA												
Polychaeta												
Amastigos acutus												
Armandia brevis		5001580202										
Chaetozone bansei												
Cirratulidae Indet.		500150										
Eteone sp.		50011302										
Euzonus sp. 1		50015807										
Glycera macrobranchia		5001270110										
Glycinde armigera		5001280103										
Glycera sp.		50012801										1
Heteropodarke heteromorpha		5001211101										
Magelona sacculata		5001440116										
Mediomastus sp.		50016004										
Microphthalmus sp.		50012102	1						1			
Nephrys californiensis		5001250113										
Ophelia limacina		5001580301										
Ophelia sp.		50015803		2								
Opheliidae Indet.		500158	15						8			1
Paleanotus bellis		5001080101										
Paronidae Indet.		500141										
Phyllocoelidae Indet.		500113										1
Polychaeta Indet.		5001						1		1		1
Scoloplos armiger		5001400301										1
Spio butleri		5001430703	1			1						
Spio sp.		50014307										
Spionidae Indet.		500143							3			
Spiophanes bombyx		5001431001										
Syllidae Indet.		500143										
Terebellidae Indet.		500168										
Oligochaeta		5004										
Oligochaeta Indet.		5004										
Marionina sp.		5004							2			
Canalipalpata												
Saccocirrus sp.		50020401	1									
INSECTA												
Insecta Indet. Larvae		62										

HMB SUBTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time		1145	1145	1145	1145	1145	1145	1145	1145	1145	1145	1145
Station		HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7	HMB Sub 7
Replicate		H 0.25mm	J 1mm	I 1mm	10.5mm	10.5mm	10.25mm	10.25mm	J 1mm	J 1mm	J 0.5mm	J 0.5mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and				0.0001		0.0006					0.0016
Mollusca weight (gm)*	juveniles						0.0015					0.0002
Crustacea weight (gm)*	combined			0.0058			0.0009		0.0011			0.0011
Polychaeta weight (gm)*				0.0227		0.0035		0.0016		0.001		0.0014
Nematoda (do not include in data)								1428				741
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Platyhelminthes												
Platyhelminthes Indet.	39	1										
Nemertea												
Nemertea Indet.	43	17							17			
MOLLUSCA												
Bivalvia												
Bivalvia Indet.	5515								14			
Siliqua patula	5515290101											
Tellina nuculoides	5515310202											
Tellinidae Indet.	551531											
Gastropoda												
Gastropoda Indet.	51											
ARTHROPODA												
Arachnida												
Acarina Indet.	5922											
Crustacea												
Balanidae Indet.	616937											
Coprophoidea Indet.	616915											
Eohaustorius brevicuspis		1										
Eohaustorius washingtonianus	6169220101											
Gammaridea Indet.	616922											
Harpacticoida Indet.	6119						12	1				30
Harpacticus sp.	61191001											1
Lampropidae Indet.	615401											
Mandibulophoxus mayi		2										
Ostracoda Indet.	6110								1			
Pacifoculodes spinipes	6169370822											
Protomedaea sp.	61692603											
Rhepoxyinius boreovariatus								1				
Tisbe sp.	61191301											
Zaus sp.	61191002											
ANNELIDA												
Polychaeta												
Amastigos acutus												
Armandia brevis	5001580202											
Chaetozone bansei												
Cirratulidae Indet.	500150											
Eteone sp.	50011302											
Euzonus sp. 1	50015807	1										
Glycera macrobranchia	5001270110											
Glycinde armigera	5001280103											
Glycera sp.	50012801											
Heteropodarke heteromorpha	5001211101											
Magelona sacculata	5001440116											
Mediomastus sp.	50016004											
Microphthalmus sp.	50012102											
Nephrys californiensis	5001250113											
Ophelia limacina	5001580301											
Ophelia sp.	50015803											
Opheliidae Indet.	500158	1		1		5		7				
Paleanotus bellis	5001080101											
Paronidae Indet.	500141											
Phyllocoelidae Indet.	500113											
Polychaeta Indet.	5001	1		1		1	1					1
Scoloplos armiger	5001400301											
Spio butleri	5001430703								1			1
Spio sp.	50014307											
Spionidae Indet.	500143	2						2				
Spiophanes bombyx	5001431001		1									
Syllidae Indet.	500143											
Terebellidae Indet.	500168							1				
Oligochaeta	5004											
Oligochaeta Indet.	5004											
Marionina sp.	5004											
Canalipalpata												
Saccocirrus sp.	50020401	5						11				
INSECTA												
Insecta Indet. Larvae	62					1						

## Half Moon Bay Subtidal June 2004

HMB SUBTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time		1145	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
Station		HMB Sub 7	HMB Sub 8	HMB Sub 8	HMB Sub 8	HMB Sub 8	HMB Sub 8	HMB Sub 8	HMB Sub 8	HMB Sub 8	HMB Sub 8	HMB Sub 8
Replicate		J 0.25mm	A 1mm	A 1mm	A 0.5mm	A 0.5mm	A 0.25mm	A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.5mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and						0.0037					0.0019
Mollusca weight (gm)*	juveniles						0.0002					
Crustacea weight (gm)*	combined								0.0007			0.0002
Polychaeta weight (gm)*					0.0019		0.007		0.0005		0.0002	0.0029
Nematoda (do not include in data)		1					213					192
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Platyhelminthes												
Platyhelminthes Indet.		39										
Nemertea												
Nemertea Indet.		43	18						44			
MOLLUSCA												
Bivalvia												
Bivalvia Indet.		5515	2						2			
Siliqua patula		5515290101										
Tellina nuculoides		5515310202										
Tellinidae Indet.		551531										
Gastropoda												
Gastropoda Indet.		51										
ARTHROPODA												
Arachnida												
Acarina Indet.		5922										
Crustacea												
Balanidae Indet.		616937										
Coprophoidea Indet.		616915										
Eohaustorius brevicuspis												
Eohaustorius washingtonianus		6169220101										
Gammaridea Indet.		616922										
Harpacticoida Indet.		6119	1									3
Harpacticus sp.		61191001										
Lampropidae Indet.		615401										
Mandibulophoxus mayi									1			
Ostracoda Indet.		6110										
Pacifoculodes spinipes		6169370822										
Protomedieia sp.		61692603										
Rhepoxyinius boreovariatus												
Tisbe sp.		61191301										
Zaus sp.		61191002										
ANNELIDA												
Polychaeta												
Amastigos acutus												
Armandia brevis		5001580202										
Chaetozone bansei												
Cirratulidae Indet.		500150										
Eteone sp.		50011302	1									
Euzonus sp. 1		50015807										
Glycera macrobranchia		5001270110										
Glycinde armigera		5001280103										
Glycera sp.		50012801										
Heteropodarke heteromorpha		5001211101										
Magelona sacculata		5001440116										
Mediomastus sp.		50016004										
Microphthalmus sp.		500121102										
Nephrys californiensis		5001250113										
Ophelia limacina		5001580301										
Ophelia sp.		50015803					1					
Opheliidae Indet.		500158	9						1			1
Paleanotus bellis		5001080101										
Paronidae Indet.		500141										
Phyllocoelidae Indet.		500113										
Polychaeta Indet.		5001										
Scoloplos armiger		5001400301							1	1		
Spio butleri		5001430703							1			
Spio sp.		50014307										
Spionidae Indet.		500143	3									
Spiophanes bombyx		5001431001										
Syllidae Indet.		500143										
Terebellidae Indet.		500168										
Oligochaeta		5004										
Oligochaeta Indet.		5004										
Marionina sp.		5004	4						2			
Canalipalpata												
Saccocirrus sp.		50020401	10						223			
INSECTA												
Insecta Indet. Larvae		62										

## Half Moon Bay Subtidal June 2004

HMB SUBTIDAL SAMPLES JUNE 2004								
Analyzed by Columbia Science								
Date		6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04	6/29/04
Time		1200	1200	1200	1200	1200	1200	1200
Station		HMB Sub 8	HMB Sub 8	HMB Sub 8	HMB Sub 8	HMB Sub 8	HMB Sub 8	HMB Sub 8
Replicate		B 0.25mm	C 1mm	C 1mm	C 0.5mm	C 0.5mm	C 0.25mm	C 0.25mm
Echinoderm Weight (gm)*	*weights are							
Miscellaneous weight (gm)*	adults and							0.0051
Mollusca weight (gm)*	juveniles							
Crustacea weight (gm)*	combined		0.0021					0.0002
Polychaeta weight (gm)*								0.0069
Nematoda (do not include in data)				2			297	
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile
MISCELLANEOUS								
Platyhelminthes								
Platyhelminthes Indet.	39							1
Nemertea								
Nemertea Indet.	43	39						107
MOLLUSCA								
Bivalvia								
Bivalvia Indet.	5515							
Siliqua patula	5515290101							
Tellina nuculoides	5515310202							
Tellinidae Indet.	551531							
Gastropoda								
Gastropoda Indet.	51							
ARTHROPODA								
Arachnida								
Acarina Indet.	5922							
Crustacea								
Balanidae Indet.	616937							
Coprophoidea Indet.	616915							
Eohaustorius brevicuspis								
Eohaustorius washingtonianus	6169220101		1					
Gammaridea Indet.	616922							
Harpacticoida Indet.	6119						4	
Harpacticus sp.	61191001							
Lampropidae Indet.	615401							
Mandibulophoxus mayi								
Ostracoda Indet.	6110							
Pacifoculodes spinipes	6169370822							
Protomedieia sp.	61692603							
Rhepoxyinius boreovariatus								
Tisbe sp.	61191301							
Zaus sp.	61191002							
ANNELIDA								
Polychaeta								
Amastigus acutus								
Armandia brevis	5001580202							
Chaetozone bansei								
Cirratulidae Indet.	500150							
Eteone sp.	50011302							
Euzonus sp. 1	50015807							
Glycera macrobranchia	5001270110							
Glycinde armigera	5001280103							
Glycera sp.	50012801							
Heteropodarke heteromorpha	5001211101							
Magelona sacculata	5001440116							
Mediomastus sp.	50016004							
Microphthalmus sp.	50012102							
Nephrys californiensis	5001250113							
Ophelia limacina	5001580301							
Ophelia sp.	50015803							
Opheliidae Indet.	500158	3					1	
Paleanotus bellis	5001080101							
Paranoidae Indet.	500141							
Phyllocoelidae Indet.	500113							
Polychaeta Indet.	5001							
Scoloplos armiger	5001400301							
Spio butleri	5001430703							
Spio sp.	50014307						1	
Spionidae Indet.	500143							
Spiophanes bombyx	5001431001							
Syllidae Indet.	500143							
Terebellidae Indet.	500168							
Oligochaeta	5004							
Oligochaeta Indet.	5004					1	1	
Marionina sp.	5004	2					2	
Canalipalpata								
Saccocirrus sp.	50020401	103					249	
INSECTA								
Insecta Indet. Larvae	62							

## South Beach Intertidal Jun 2004

SOUTH BEACH INTERTIDAL SAMPLES JUNE 2004											
Analyzed by Columbia Science											
Date		6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04
Time		540	540	540	540	540	540	540	540	540	540
Station		SB 1+0	SB 1+0	SB 1+0	SB 1+0	SB 1+0	SB 1+0	SB 1+0	SB 1+0	SB 1+0	SB 1+0
Replicate		A 1mm	A 1mm	A 0.5mm	A 0.5mm	A 0.25mm	A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.25mm
Echinoderm Weight (gm)*	*weights are										
Miscellaneous weight (gm)*	adults and			0.0002		0.0042			0.0001		0.0033
Mollusca weight (gm)*	juveniles										
Crustacea weight (gm)*	combined										
Polychaeta weight (gm)*								0.0017		0.0011	0.0006
Nematoda (do not include in data)						164					102
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS											
Nemertea											
Nemertea Indet.	43			2			148			1	
Platyhelminthes											
Platyhelminthes Indet.	39										
ARTHROPODA											
Crustacea											
Eohaustorius brevicuspis											
Eohaustorius washingtonianus	6169220101										
Gammaridea Indet.	6169										
Halacaridae Indet.	593001										
ANNELIDA											
Polychaeta											
Eteone columbiensis											
Eteone sp.	50011302										
Euzonus sp. 1	50015807										
Microphthalmus sp.	50012102										
Nephtys californiensis	5001250113							1			1
Opheliidae Indet.	500158										
Polychaeta Indet.	5001										
Spio butleri	5001430708										
Syllidae Indet.	500123										
Oligochaeta											
Oligochaeta Indet.	5004										
Canalipalpata											
Saccocirrus sp.	50020401										
Unidentified											
Terrestrial Insecta											
Trichoptera larvae	62		1								

## South Beach Intertidal Jun 2004

SOUTH BEACH INTERTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04
Time		540	540	540	540	540	540	550	550	550	550	550
Station		SB 1+0	SB 1+0	SB 1+0	SB 1+0	SB 1+0	SB 1+0	SB 1+4	SB 1+4	SB 1+4	SB 1+4	SB 1+4
Replicate		B 0.25mm	C 1mm	C 1mm	C 0.5mm	C 0.5mm	C 0.25mm	C 0.25mm	A 1mm	A 1mm	A 0.5mm	A 0.25mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and				0.0002		0.005				0.0002	0.0021
Mollusca weight (gm)*	juveniles											
Crustacea weight (gm)*	combined				0.0019							
Polychaeta weight (gm)*			0.0018				0.0011		0.0039		0.0002	0.0001
Nematoda (do not include in data)							116					114
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile
MISCELLANEOUS												
Nemertea												
Nemertea Indet.	43	111			2			174				
Platyhelminthes												
Platyhelminthes Indet.	39	2						4				
ARTHROPODA												
Crustacea												
Eohaustorius brevicuspis												
Eohaustorius washingtonianus	6169220101				1							
Gammaridea Indet.	6169											
Halacaridae Indet.	593001											
ANNELIDA												
Polychaeta												
Eteone columbiensis												
Eteone sp.	50011302											
Euzonus sp. 1	50015807											
Microphthalmus sp.	50012102											
Nephtys californiensis	5001250113		1						2			
Opheliidae Indet.	500158	8						29				
Polychaeta Indet.	5001											
Spio butleri	5001430708											
Syllidae Indet.	500123											
Oligochaeta												
Oligochaeta Indet.	5004											
Canalipalpata												
Saccocirrus sp.	50020401											
Unidentified												
Terrestrial Insecta												
Trichoptera larvae	62											

South Beach Intertidal Jun 2004

SOUTH BEACH INTERTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04
Time		550	550	550	550	550	550	550	550	550	550	550
Station		SB 1+4	SB 1+4	SB 1+4	SB 1+4	SB 1+4	SB 1+4	SB 1+4	SB 1+4	SB 1+4	SB 1+4	SB 1+4
Replicate		A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.5mm	B 0.25mm	C 1mm	C 1mm	C 0.5mm	C 0.5mm	C 0.25mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and		0.0086				0.0019			0.0002		0.0017
Mollusca weight (gm)*	juveniles											
Crustacea weight (gm)*	combined									0.0007		
Polychaeta weight (gm)*			0.0712		0.0002		0.0002		0.0022			0.0007
Nematoda (do not include in data)							78					78
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Nemertea												
Nemertea Indet.	43	70	1					47			1	
Platyhelminthes												
Platyhelminthes Indet.	39											
ARTHROPODA												
Crustacea												
Eohaustorius brevicuspis									1			
Eohaustorius washingtonianus	6169220101											
Gammaridea Indet.	6169											
Halacaridae Indet.	593001											
ANNELIDA												
Polychaeta												
Eteone columbiensis												
Eteone sp.	50011302											
Euzonus sp. 1	50015807											
Microphthalmus sp.	50012102											
Nephtys californiensis	5001250113	1	1						1			
Opheliidae Indet.	500158	1										
Polychaeta Indet.	5001											
Spio butleri	5001430708				1		1					
Syllidae Indet.	500123											
Oligochaeta												
Oligochaeta Indet.	5004											
Canalipalpata												
Saccocirrus sp.	50020401											
Unidentified												
Terrestrial Insecta												
Trichoptera larvae	62											

## South Beach Intertidal Jun 2004

SOUTH BEACH INTERTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04
Time		550	600	600	600	600	600	600	600	600	600	600
Station		SB 1+4	SB 1+8	SB 1+8	SB 1+8	SB 1+8	SB 1+8	SB 1+8	SB 1+8	SB 1+8	SB 1+8	SB 1+8
Replicate		C 0.25mm	A 1mm	A 1mm	A 0.5mm	A 0.5mm	A 0.25mm	A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.25mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and						0.0042					0.0022
Mollusca weight (gm)*	juveniles											
Crustacea weight (gm)*	combined		0.0296		0.0007				0.0276		0.0031	
Polychaeta weight (gm)*					0.0003						0.0011	0.0004
Nematoda (do not include in data)							53					
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Nemertea												
Nemertea Indet.	43							73				
Platyhelminthes												
Platyhelminthes Indet.	39											
ARTHROPODA												
Crustacea												
Eohaustorius brevicuspis		18			4			20	1	2		
Eohaustorius washingtonianus	6169220101											
Gammaridea Indet.	6169									1		
Halacaridae Indet.	593001											
ANNELIDA												
Polychaeta												
Eteone columbiensis										1		
Eteone sp.	50011302											
Euzonus sp. 1	50015807					1						
Microphthalmus sp.	50012102											
Nephtys californiensis	5001250113											
Opheliidae Indet.	500158											
Polychaeta Indet.	5001											
Spio butleri	5001430708											
Syllidae Indet.	500123											
Oligochaeta												
Oligochaeta Indet.	5004											
Canalipalpata												
Saccocirrus sp.	50020401											
Unidentified												
Terrestrial Insecta												
Trichoptera larvae	62											

South Beach Intertidal Jun 2004

SOUTH BEACH INTERTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04
Time		600	600	600	600	600	600	610	610	610	610	610
Station		SB 1+8	SB 1+8	SB 1+8	SB 1+8	SB 1+8	SB 1+8	SB 1+12	SB 1+12	SB 1+12	SB 1+12	SB 1+12
Replicate		B 0.25mm	C 1mm	C 1mm	C 0.5mm	C 0.5mm	C 0.25mm	A 1mm	A 1mm	A 0.5mm	A 0.5mm	A 0.25mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and				0.0001		0.0017		0.0002			0.0001
Mollusca weight (gm)*	juveniles											
Crustacea weight (gm)*	combined		0.0205		0.0013							
Polychaeta weight (gm)*					0.0003							
Nematoda (do not include in data)							59					
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Nemertea												
Nemertea Indet.	43	65			1			65	1			
Platyhelminthes												
Platyhelminthes Indet.	39											
ARTHROPODA												
Crustacea												
Eohaustorius brevicuspis			13	1	2							
Eohaustorius washingtonianus	6169220101											
Gammaridea Indet.	6169											
Halacaridae Indet.	593001											
ANNELIDA												
Polychaeta												
Eteone columbiensis												
Eteone sp.	50011302											
Euzonus sp. 1	50015807											
Microphthalmus sp.	50012102											
Nephtys californiensis	5001250113											
Opheliidae Indet.	500158											
Polychaeta Indet.	5001											
Spio butleri	5001430708	3			1							
Syllidae Indet.	500123											
Oligochaeta												
Oligochaeta Indet.	5004											1
Canalipalpata												
Saccocirrus sp.	50020401											
Unidentified												
Terrestrial Insecta												
Trichoptera larvae	62											

South Beach Intertidal Jun 2004

SOUTH BEACH INTERTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04
Time		610	610	610	610	610	610	610	610	610	610	610
Station		SB 1+12	SB 1+12	SB 1+12	SB 1+12	SB 1+12	SB 1+12	SB 1+12	SB 1+12	SB 1+12	SB 1+12	SB 1+12
Replicate		A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.5mm	B 0.25mm	C 1mm	C 1mm	C 0.5mm	C 0.5mm	C 0.25mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and		0.0004		0.0005			0.0002				
Mollusca weight (gm)*	juveniles											
Crustacea weight (gm)*	combined											
Polychaeta weight (gm)*												
Nematoda (do not include in data)												
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Nemertea												
Nemertea Indet.	43											
Platyhelminthes												
Platyhelminthes Indet.	39											
ARTHROPODA												
Crustacea												
Eohaustorius brevicuspis												
Eohaustorius washingtonianus	6169220101											
Gammaridea Indet.	6169											
Halacaridae Indet.	593001											
ANNELIDA												
Polychaeta												
Eteone columbiensis												
Eteone sp.	50011302											
Euzonus sp. 1	50015807											
Microphthalmus sp.	50012102											
Nephtys californiensis	5001250113											
Opheliidae Indet.	500158											
Polychaeta Indet.	5001											
Spio butleri	5001430708											
Syllidae Indet.	500123											
Oligochaeta												
Oligochaeta Indet.	5004											
Canalipalpata												
Saccocirrus sp.	50020401											
Unidentified												
Terrestrial Insecta					1							
Trichoptera larvae	62					1				1		

## South Beach Intertidal Jun 2004

SOUTH BEACH INTERTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04
Time		610	525	525	525	525	525	525	525	525	525	525
Station		SB 1+12	SB 2+0	SB 2+0	SB 2+0	SB 2+0	SB 2+0	SB 2+0	SB 2+0	SB 2+0	SB 2+0	SB 2+0
Replicate		C 0.25mm	A 1mm	A 1mm	A 0.5mm	A 0.5mm	A 0.25mm	A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.25mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and						0.0021				0.0001	0.0018
Mollusca weight (gm)*	juveniles											
Crustacea weight (gm)*	combined		0.0017								0.0006	0.0001
Polychaeta weight (gm)*				0.0013			0.0001		0.0027		0.0008	0.0003
Nematoda (do not include in data)							32					96
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Nemertea												
Nemertea Indet.	43							84			1	
Platyhelminthes												
Platyhelminthes Indet.	39							3				
ARTHROPODA												
Crustacea												
Eohaustorius brevicuspis			1									1
Eohaustorius washingtonianus	6169220101											
Gammaridea Indet.	6169											
Halacaridae Indet.	593001											1
ANNELIDA												
Polychaeta												
Eteone columbiensis												
Eteone sp.	50011302											
Euzonus sp. 1	50015807											
Microphthalmus sp.	50012102											
Nephtys californiensis	5001250113				1				1			
Opheliidae Indet.	500158											
Polychaeta Indet.	5001											
Spio butleri	5001430708									2		
Syllidae Indet.	500123											
Oligochaeta												
Oligochaeta Indet.	5004											
Canalipalpata												
Saccocirrus sp.	50020401							2				
Unidentified												
Terrestrial Insecta												
Trichoptera larvae	62											

## South Beach Intertidal Jun 2004

SOUTH BEACH INTERTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04
Time		525	525	525	525	525	525	620	620	620	620	620
Station		SB 2+0	SB 2+0	SB 2+0	SB 2+0	SB 2+0	SB 2+0	SB 2+4	SB 2+4	SB 2+4	SB 2+4	SB 2+4
Replicate		B 0.25mm	C 1mm	C 1mm	C 0.5mm	C 0.5mm	C 0.25mm	A 1mm	A 1mm	A 0.5mm	A 0.5mm	A 0.25mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and											0.0005
Mollusca weight (gm)*	juveniles											
Crustacea weight (gm)*	combined							0.0063				
Polychaeta weight (gm)*								0.0052		0.0001		0.0002
Nematoda (do not include in data)							43					144
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Nemertea												
Nemertea Indet.	43	105						97				4
Platyhelminthes												
Platyhelminthes Indet.	39							3				
ARTHROPODA												
Crustacea												
Eohaustorius brevicuspis									1			
Eohaustorius washingtonianus	6169220101											
Gammaridea Indet.	6169											
Halacaridae Indet.	593001											
ANNELIDA												
Polychaeta												
Eteone columbiensis												
Eteone sp.	50011302											
Euzonus sp. 1	50015807											
Microphthalmus sp.	50012102	4										
Nephtys californiensis	5001250113							2	1			
Opheliidae Indet.	500158	1										
Polychaeta Indet.	5001	1										1
Spio butleri	5001430708											1
Syllidae Indet.	500123											
Oligochaeta												
Oligochaeta Indet.	5004	1										
Canalipalpata												
Saccocirrus sp.	50020401											
Unidentified												
Terrestrial Insecta												
Trichoptera larvae	62											

## South Beach Intertidal Jun 2004

SOUTH BEACH INTERTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04
Time	620	620	620	620	620	620	620	620	620	620	620	620
Station	SB 2+4	SB 2+4	SB 2+4	SB 2+4	SB 2+4	SB 2+4	SB 2+4	SB 2+4	SB 2+4	SB 2+4	SB 2+4	SB 2+4
Replicate	A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.5mm	B 0.25mm	B 0.25mm	C 1mm	C 1mm	C 0.5mm	C 0.5mm	C 0.25mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and			0.0002		0.0009		0.005				0.0006
Mollusca weight (gm)*	juveniles											
Crustacea weight (gm)*	combined		0.0064					0.0054				0.0003
Polychaeta weight (gm)*		0.0023		0.0002				0.0029		0.0002		0.0005
Nematoda (do not include in data)						134						164
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Nemertea												
Nemertea Indet.	43	4			1			23	1			1
Platyhelminthes												
Platyhelminthes Indet.	39											
ARTHROPODA												
Crustacea												
Eohaustorius brevicuspis			1						1			
Eohaustorius washingtonianus	6169220101											
Gammaridea Indet.	6169											
Halacaridae Indet.	593001											
ANNELIDA												
Polychaeta												
Eteone columbiensis												
Eteone sp.	50011302											
Euzonus sp. 1	50015807											
Microphthalmus sp.	50012102											
Nephtys californiensis	5001250113		1						1			
Opheliidae Indet.	500158											
Polychaeta Indet.	5001											
Spio butleri	5001430708				1						1	
Syllidae Indet.	500123	1										
Oligochaeta												
Oligochaeta Indet.	5004											
Canalipalpata												
Saccocirrus sp.	50020401											
Unidentified												
Terrestrial Insecta												
Trichoptera larvae	62											

## South Beach Intertidal Jun 2004

SOUTH BEACH INTERTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04
Time		620	630	630	630	630	630	630	630	630	630	630
Station		SB 2+4	SB 2+8	SB 2+8	SB 2+8	SB 2+8	SB 2+8	SB 2+8	SB 2+8	SB 2+8	SB 2+8	SB 2+8
Replicate		C 0.25mm	A 1mm	A 1mm	A 0.5mm	A 0.5mm	A 0.25mm	A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.25mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and				0.0001		0.0031				0.0005	0.0004
Mollusca weight (gm)*	juveniles											
Crustacea weight (gm)*	combined		0.0376		0.0009				0.0161		0.0017	
Polychaeta weight (gm)*							0.0012				0.0004	0.0002
Nematoda (do not include in data)							129					133
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Adult
MISCELLANEOUS												
Nemertea												
Nemertea Indet.	43	21			1			67			6	
Platyhelminthes												
Platyhelminthes Indet.	39											
ARTHROPODA												
Crustacea												
Eohaustorius brevicuspis			27		4				10	2	3	
Eohaustorius washingtonianus	6169220101											
Gammaridea Indet.	6169	1										
Halacaridae Indet.	593001											
ANNELIDA												
Polychaeta												
Eteone columbiensis												
Eteone sp.	50011302											
Euzonus sp. 1	50015807											
Microphthalmus sp.	50012102											
Nephtys californiensis	5001250113											
Opheliidae Indet.	500158											
Polychaeta Indet.	5001											
Spio butleri	5001430708	4					3				2	
Syllidae Indet.	500123											
Oligochaeta												
Oligochaeta Indet.	5004											
Canalipalpata												
Saccocirrus sp.	50020401											
Unidentified												
Terrestrial Insecta												
Trichoptera larvae	62											

South Beach Intertidal Jun 2004

SOUTH BEACH INTERTIDAL SAMPLES JUNE 2004											
Analyzed by Columbia Science											
Date		6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04
Time		630	630	630	630	630	630	640	640	640	640
Station		SB 2+8	SB 2+8	SB 2+8	SB 2+8	SB 2+8	SB 2+8	SB 2+12	SB 2+12	SB 2+12	SB 2+12
Replicate		B 0.25mm	C 1mm	C 1mm	C 0.5mm	C 0.5mm	C 0.25mm	A 1mm	A 1mm	A 0.5mm	A 0.5mm
Echinoderm Weight (gm)*	*weights are										
Miscellaneous weight (gm)*	adults and				0.0008		0.0017				
Mollusca weight (gm)*	juveniles										
Crustacea weight (gm)*	combined		0.0228		0.0014						
Polychaeta weight (gm)*			0.5502		0.0008		0.0011				
Nematoda (do not include in data)							92				
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult
MISCELLANEOUS											
Nemertea											
Nemertea Indet.	43	20			5			35			
Platyhelminthes											
Platyhelminthes Indet.	39										
ARTHROPODA											
Crustacea											
Eohaustorius brevicuspis		22			5						
Eohaustorius washingtonianus	6169220101										
Gammaridea Indet.	6169										
Halacaridae Indet.	593001										
ANNELIDA											
Polychaeta											
Eteone columbiensis											
Eteone sp.	50011302		1		1						
Euzonus sp. 1	50015807		6								
Microphthalmus sp.	50012102										
Nephtys californiensis	5001250113										
Opheliidae Indet.	500158					1					
Polychaeta Indet.	5001										
Spio butleri	5001430708	1			1			5			
Syllidae Indet.	500123										
Oligochaeta											
Oligochaeta Indet.	5004						2				
Canalipalpata											
Saccocirrus sp.	50020401										
Unidentified											
Terrestrial Insecta											
Trichoptera larvae	62										

## South Beach Intertidal Jun 2004

SOUTH BEACH INTERTIDAL SAMPLES JUNE 2004												
Analyzed by Columbia Science												
Date		6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04	6/30/04
Time		640	640	640	640	640	640	640	640	640	640	640
Station		SB 2+12	SB 2+12	SB 2+12	SB 2+12	SB 2+12	SB 2+12	SB 2+12	SB 2+12	SB 2+12	SB 2+12	SB 2+12
Replicate		A 0.25mm	A 0.25mm	B 1mm	B 1mm	B 0.5mm	B 0.5mm	B 0.25mm	C 1mm	C 1mm	C 0.5mm	C 0.5mm
Echinoderm Weight (gm)*	*weights are											
Miscellaneous weight (gm)*	adults and	0.0001				0.0004		0.0003				
Mollusca weight (gm)*	juveniles											
Crustacea weight (gm)*	combined											
Polychaeta weight (gm)*		0.001										
Nematoda (do not include in data)		18						9				
Taxa	NODC Code	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
		Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult
MISCELLANEOUS												
Nemertea												
Nemertea Indet.		43					1					
Platyhelminthes												
Platyhelminthes Indet.		39										
ARTHROPODA												
Crustacea												
Eohaustorius brevicuspis												
Eohaustorius washingtonianus		6169220101										
Gammaridea Indet.		6169										
Halacaridae Indet.		593001										
ANNELIDA												
Polychaeta												
Eteone columbiensis												
Eteone sp.		50011302										
Euzonus sp. 1		50015807										
Microphthalmus sp.		50012102										
Nephtys californiensis		5001250113										
Opheliidae Indet.		500158										
Polychaeta Indet.		5001										
Spio butleri		5001430708	1									
Syllidae Indet.		500123										
Oligochaeta												
Oligochaeta Indet.		5004	1					3				
Canalipalpata												
Saccocirrus sp.		50020401										
Unidentified												
Terrestrial Insecta												
Trichoptera larvae		62						1				

## South Beach Intertidal Jun 2004

SOUTH BEACH INTERTIDAL SAMPLES JUNE 2004			
Analyzed by Columbia Science			
Date		6/30/04	6/30/04
Time		640	640
Station		SB 2+12	SB 2+12
Replicate		C 0.25mm	C 0.25mm
Echinoderm Weight (gm)*	*weights are		
Miscellaneous weight (gm)*	adults and	0.0006	
Mollusca weight (gm)*	juveniles		
Crustacea weight (gm)*	combined		
Polychaeta weight (gm)*			
Nematoda (do not include in data)		6	
Taxa	NODC Code	Number	Number
		Adult	Juvenile
MISCELLANEOUS			
Nemertea			
Nemertea Indet.	43		
Platyhelminthes			
Platyhelminthes Indet.	39		
ARTHROPODA			
Crustacea			
Eohaustorius brevicuspis			
Eohaustorius washingtonianus	6169220101		
Gammaridea Indet.	6169		
Halacaridae Indet.	593001		
ANNELIDA			
Polychaeta			
Eteone columbiensis			
Eteone sp.	50011302		
Euzonus sp. 1	50015807		
Microphthalmus sp.	50012102		
Nephtys californiensis	5001250113		
Opheliidae Indet.	500158		
Polychaeta Indet.	5001		
Spio butleri	5001430708		
Syllidae Indet.	500123		
Oligochaeta			
Oligochaeta Indet.	5004	7	
Canalipalpata			
Saccocirrus sp.	50020401		
Unidentified			
Terrestrial Insecta			
Trichoptera larvae	62		

**APPENDIX C**

**BENTHIC INFAUNA ANALYSIS**

**DATA VALIDATION REPORT**

**DATA VALIDATION REPORT: BENTHIC INFAUNA ANALYSES  
HALF MOON BAY AND SOUTH BEACH JUNE-JULY SURVEY – WESTPORT, WA  
November 18, 2004**

Prepared by SAIC from Quality Control Data provided by Columbia Science

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## **TABLES**

**TABLE 1: List of Taxonomic Corrections based on QA/QC Results**

## **APPENDICES**

**Appendix C-1: Sample Sorting QA Report**

**Appendix C-2: Verification of Polychaeta Voucher Collection**

## **INTRODUCTION**

Benthic invertebrate sampling was conducted at Half Moon Bay and South Beach at subtidal and intertidal locations. The benthic surveys were designed to identify the benthic community composition prior to material placement and again following material placement. The objective of these two surveys was to document the changes in population density and community composition from the baseline to post dredged material placement in Half Moon Bay.

## **SUMMARY OF DATA QUALITY**

The sampling and analysis of benthic infauna community at Half Moon Bay and South Beach followed the recommended protocols and guidelines set forth by the Statement of Work. No significant issues with the quality of data were identified. The results of this survey may be used for the intended purpose of determining the post material placement benthic community changes in abundance or community composition of benthic invertebrate species from the baseline surveys.

## **LABORATORY ANALYSIS**

Samples were classified by major phyla (Polychaeta, Crustacea, Mollusca, and Miscellaneous phyla) and identified to the lowest possible taxonomic level. A minimum of one specimen per species identified was included in a voucher collection and sent for verification by a taxonomic expert.

## **QUALITY ASSURANCE / QUALITY CONTROL**

Due to insufficient sediment in the 1mm and 0.5mm sieves, 20% of the total number of samples were resorted at the 100% level. The samples selected for QA were then determined through a random number system.

The 0.25mm sieve fraction contained the largest quantity of sand and, due to the compact nature of the material, sub sampling with a Folsom-type splitter was not possible. In the sorting of the samples, the sample was rinsed multiple times through a 0.125mm sieve and the elutriate sorted out, followed by scanning the sand. Nothing was found remaining in the sand fraction so each 250 micron sample was QA'd in the following manner: The sample was rinsed several times through a 125 micron sieve and 100% of the elutriate was re-sorted. The remaining sand was divided into fourths and 25% of the sand was scanned. No invertebrates were found in the sand—those that were found were in the elutriate portion. The notation on the QA sheet of 100/25 means that 100% of the elutriate and 25% of the sand was QA'd. Because nothing was found in the sand, it was assumed that 100% of the sample was QA'd and the invertebrates found were not multiplied by any factor. Most of the samples yielded few invertebrates. Thus, if even one additional organism was found in the QA it triggered a re-sort.

In summary, of the samples undergoing QA, 26 additional invertebrates were found out of 2437 originally picked, for an overall sorting success of 99%. With the second QA on those samples triggering a re-sort-the final number is 99+%.

Sheila Byers, of Vancouver, B.C., performed Taxonomic Identification QC checks. Original Benthic data sheets were updated based on QA findings and a summary of changes can be found in Table 1.

The QA/QC procedures described here identified no significant problems with benthic data analysis.

## DATA DELIVERABLES

Columbia Analytical submitted Quality Control checked and updated Benthic Invertebrate data to SAIC via Excel spreadsheets November 2004.

**Table 1:** List of Taxonomic Corrections based on QA/QC Results

Original Identification	Final Identification
<i>Caulieriella</i> sp.	<i>Amastigos acutus</i>
<i>Eteone</i> sp.	<i>Eteone columbiensis</i>
<i>Syllis</i> sp.	Syllidae Indet.
Oligochaeta HMB 999	<i>Marionina</i> sp.
<i>Mediomastus ambiseta</i>	<i>Mediomastus</i> sp.
<i>Syllis elongata</i>	<i>Typosyllis pigmentata</i>
<i>Euzonus mucronata</i>	<i>Euzonus</i> sp.
<i>Spio filicornis</i>	<i>Spio butleri</i>
Archiannelida	<i>Protodrilus flabellifer</i>
<i>Scolelepis squamata</i>	<i>Spio butleri</i>
<i>Scoloplos armiger</i>	<i>Spio butleri</i>

**Appendix C-1  
Sample Sorting QA Report**

Sorting QA for Half Moon Bay and South Beach June 2004						
By Columbia Science for SAIC						
Note: 20% of total samples QA'd. If one in a series (.25 A,B,C) failed QA, the other two in that series were re-sorted.						
						QA #2
Station	Sieve	% of sample checked	# found	Original #	% removed in first sort	Resort Needed? Final sort %
HMB 2+0 A	1 mm			1		
HMB 2+0 A	.5mm			3		
HMB 2+0 A	.25mm			41		
HMB 2+0 B	1mm			3		
HMB 2+0 B	.5mm			2		
HMB 2+0 B	.25mm			9		
HMB 2+0 C	1mm			1		
HMB 2+0 C	.5mm			2		
HMB 2+0 C	.25mm			37		
HMB 2+0 D	1mm	100	0	1	100	n
HMB 2+0 D	.5mm	100	0	5	100	n
HMB 2+0 D	.25mm	100	0	82	100	n
HMB 2+0 E	1mm			0		
HMB 2+0 E	.5mm			1		
HMB 2+0 E	.25mm			0		
HMB 2+0 F	1mm			1		
HMB 2+0 F	.5mm			3		
HMB 2+0 F	.25mm			68		
HMB 2+0 G	1mm	100	0	2	100	n
HMB 2+0 G	.5mm	100	0	3	100	n
HMB 2+0 G	.25mm	100	0	18	100	n
HMB 2+0 H	1mm			2		
HMB 2+0 H	.5mm			1		
HMB 2+0 H	.25mm			5		
HMB 2+0 I	1mm			4		
HMB 2+0 I	.5mm			1		
HMB 2+0 I	.25mm			22		
HMB 2+0 J	1mm			2		
HMB 2+0 J	.5mm			3		
HMB 2+0 J	.25mm			17		
HMB 2+4 A	1mm	100	0	0	100	n
HMB 2+4 A	.5mm	100	0	1	100	n
HMB 2+4 A	.25mm	100	0	17	100	n
HMB 2+4 B	1mm			0		
HMB 2+4 B	.5mm			2		
HMB 2+4 B	.25mm			10		
HMB 2+4 C	1mm			3		
HMB 2+4 C	.5mm			0		
HMB 2+4 C	.25mm			10		
HMB 3+0 A	1mm			1		
HMB 3+0 A	.5mm			1		

		QA #1					QA #2	
	Sieve	% of sample checked		# found	Original #	% removed in first sort	Resort Needed?	Final sort %
Station	Size							
HMB 3+0 A	.25mm				21			
HMB 3+0 B	1mm	100	0	3	100	n		
HMB 3+0 B	.5mm	100	0	0	100	n		
HMB 3+0 B	.25mm	100	0	15	100	n		
HMB 3+0 C	1mm				3			
HMB 3+0 C	.5mm				1			
HMB 3+0 C	.25mm				13			
HMB 3+4 A	1mm				1			
HMB 3+4 A	.5mm				0			
HMB 3+4 A	.25mm				48			
HMB 3+4 B	1mm	100	0	1	100	n		
HMB 3+4 B	.5mm	100	0	1	100	n		
HMB 3+4 B	.25mm	100	0	45	100	n		
HMB 3+4 C	1mm				0			
HMB 3+4 C	.5mm				0			
HMB 3+4 C	.25mm				30			
HMB 3+8 A	1mm				0			
HMB 3+8 A	.5mm				0			
HMB 3+8 A	.25mm				23			
HMB 3+8 B	1mm				0			
HMB 3+8 B	.5mm				0			
HMB 3+8 B	.25mm				13			
HMB 3+8 C	1mm				0			
HMB 3+8 C	.5mm				0			
HMB 3+8 C	.25mm				19			
HMB 4+0 A	1mm				0			
HMB 4+0 A	.5mm	100	0	0	100	n		
HMB 4+0 A	.25mm				14			
HMB 4+0 B	1mm				1			
HMB 4+0 B	.5mm	100	0	0	100	n		
HMB 4+0 B	.25mm				7			
HMB 4+0 C	1mm	100	0	0	100	n		
HMB 4+0 C	.5mm	100	2	4	67	y	0	100
HMB 4+0 C	.25mm	100	0	14	100	n		
HMB 4+4 A	1mm				1			
HMB 4+4 A	.5mm				0			
HMB 4+4 A	.25mm				19			
HMB 4+4 B	1mm				2			
HMB 4+4 B	.5mm				1			
HMB 4+4 B	.25mm				18			
HMB 4+4 C	1mm				1			
HMB 4+4 C	.5mm				3			
HMB 4+4 C	.25mm				10			
HMB 4+8 A	1mm				0			
HMB 4+8 A	.5mm				0			
HMB 4+8 A	.25mm				2			
HMB 4+8 B	1mm				0			
HMB 4+8 B	.5mm				0			

		QA #1					QA #2	
	Sieve	% of sample			% removed	Resort		Final
Station	Size	checked	# found	Original #	in first sort	Needed?		sort %
HMB 4+8 B	.25mm			7				
HMB 4+8 C	1mm			0				
HMB 4+8 C	.5mm			0				
HMB 4+8 C	.25mm			8				
HMB 4+8 D	1mm			0				
HMB 4+8 D	.5mm			0				
HMB 4+8 D	.25mm			4				
HMB 4+8 E	1mm			0				
HMB 4+8 E	.5mm			0				
HMB 4+8 E	.25mm			4				
HMB 4+8 F	1mm	100	0	0	100	n		
HMB 4+8 F	.5mm	100	0	0	100	n		
HMB 4+8 F	.25mm	100	0	6	100	n		
HMB 4+8 G	1mm			0				
HMB 4+8 G	.5mm			0				
HMB 4+8 G	.25mm			7				
HMB 4+8 H	1mm	100	0	0	100	n		
HMB 4+8 H	.5mm	100	0	0	100	n		
HMB 4+8 H	.25mm	100	0	13	100	n		
HMB 4+8 I	1mm			0				
HMB 4+8 I	.5mm			0				
HMB 4+8 I	.25mm			10				
HMB 4+8 J	1mm			0				
HMB 4+8 J	.5mm			0				
HMB 4+8 J	.25mm			6				
HMB 4+12 A	1mm			0				
HMB 4+12 A	.5mm			0				
HMB 4+12 A	.25mm			1				
HMB 4+12 B	1mm	100	0	0	100	n		
HMB 4+12 B	.5mm	100	0	0	100	n		
HMB 4+12 B	.25mm	100	0	3	100	n		
HMB 4+12 C	1mm			0				
HMB 4+12 C	.5mm			0				
HMB 4+12 C	.25mm			0				
HMB 5+0 A	1mm			0				
HMB 5+0 A	.5mm			0				
HMB 5+0 A	.25mm			6				
HMB 5+0 B	1mm			0				
HMB 5+0 B	.5mm			0				
HMB 5+0 B	.25mm			11				
HMB 5+0 C	1mm	100	0	0	100	n		
HMB 5+0 C	.5mm	100	0	0	100	n		
HMB 5+0 C	.25mm	100	0	33	100	n		
HMB 5+4 A	1mm			1				
HMB 5+4 A	.5mm			1				
HMB 5+4 A	.25mm			8				
HMB 5+4 B	1mm			1				
HMB 5+4 B	.5mm			1				

		QA #1					QA #2	
	Sieve	% of sample checked		# found	Original #	% removed in first sort	Resort Needed?	Final sort %
Station	Size							
HMB 5+4 B	.25mm				9			
HMB 5+4 C	1mm				1			
HMB 5+4 C	.5mm				0			
HMB 5+4 C	.25mm				9			
HMB 5+8 A	1mm	100		0	0	100	n	
HMB 5+8 A	.5mm	100		0	0	100	n	
HMB 5+8 A	.25mm	100		0	14	100	n	
HMB 5+8 B	1mm				0			
HMB 5+8 B	.5mm				1			
HMB 5+8 B	.25mm				17			
HMB 5+8 C	1mm				0			
HMB 5+8 C	.5mm				0			
HMB 5+8 C	.25mm				10			
HMB 5+12 A	1mm	100		0	0	100	n	
HMB 5+12 A	.5mm	100		0	0	100	n	
HMB 5+12 A	.25mm	100		0	1	100	n	
HMB 5+12 B	1mm				0			
HMB 5+12 B	.5mm				1			
HMB 5+12 B	.25mm				0			
HMB 5+12 C	1mm				0			
HMB 5+12 C	.5mm				0			
HMB 5+12 C	.25mm				0			
HMB Sub1 A	1mm				1			
HMB Sub1 A	.5mm				0			
HMB Sub1 A	.25mm				34			
HMB Sub1 B	1mm				2			
HMB Sub1 B	.5mm				1			
HMB Sub1 B	.25mm				28			
HMB Sub1 C	1mm				7			
HMB Sub1 C	.5mm				5			
HMB Sub1 C	.25mm				32			
HMB Sub2 A	1mm				0			
HMB Sub2 A	.5mm				2			
HMB Sub2 A	.25mm				32			
HMB Sub2 B	1mm				4			
HMB Sub2 B	.5mm				2			
HMB Sub2 B	.25mm				32			
HMB Sub2 C	1mm				4			
HMB Sub2 C	.5mm				0			
HMB Sub2 C	.25mm				66			
HMB Sub3 A	1mm	100		0	5	100	n	
HMB Sub3 A	.5mm	100		0	3	100	n	
HMB Sub3 A	.25mm	100		1	263	100	n	
HMB Sub3 B	1mm	100		0	3	100	n	
HMB Sub3 B	.5mm	100		0	0	100	n	
HMB Sub3 B	.25mm	100		2	109	98	n	
HMB Sub3 C	1mm				1			
HMB Sub3 C	.5mm				1			

		QA #1					QA #2	
	Sieve	% of sample			% removed	Resort		Final
Station	Size	checked	# found	Original #	in first sort	Needed?		sort %
HMB Sub3 C	.25mm			108				
HMB Sub4 A	1mm			11				
HMB Sub4 A	.5mm			18				
HMB Sub4 A	.25mm			92				
HMB Sub4 B	1mm			5				
HMB Sub4 B	.5mm			25				
HMB Sub4 B	.25mm			67				
HMB Sub4 C	1mm	100	0	1	100	n		
HMB Sub4 C	.5mm	100	0	7	100	n		
HMB Sub4 C	.25mm	100	0	88	100	n		
HMB Sub5 A	1mm			3				
HMB Sub5 A	.5mm			0				
HMB Sub5 A	.25mm			231				
HMB Sub5 B	1mm	100	0	3	100	n		
HMB Sub5 B	.5mm	100	0	1	100	n		
HMB Sub5 B	.25mm	100	0	92	100	n		
HMB Sub5 C	1mm			2				
HMB Sub5 C	.5mm			4				
HMB Sub5 C	.25mm			523				
HMB Sub6 A	1mm			5				
HMB Sub6 A	.5mm	100	0	1	100	n		
HMB Sub6 A	.25mm	100	0	36	100	n		
HMB Sub6 B	1mm			4				
HMB Sub6 B	.5mm	100	0	2	100	n		
HMB Sub6 B	.25mm	100	0	54	100	n		
HMB Sub6 C	1mm	100	0	1	100	n		
HMB Sub6 C	.5mm	100	1	1	0	y	0	100
HMB Sub6 C	.25mm	100	5	32	87	y	0	100
HMB Sub7 A	1mm			3				
HMB Sub7 A	.5mm			0				
HMB Sub7 A	.25mm			15				
HMB Sub7 B	1mm			2				
HMB Sub7 B	.5mm			5				
HMB Sub7 B	.25mm			40				
HMB Sub7 C	1mm	100	0	3	100	n		
HMB Sub7 C	.5mm	100	0	3	100	n		
HMB Sub7 C	.25mm	100	1	32	97	n		
HMB Sub7 D	1mm			14				
HMB Sub7 D	.5mm			5				
HMB Sub7 D	.25mm			42				
HMB Sub7 E	1mm			4				
HMB Sub7 E	.5mm			2				
HMB Sub7 E	.25mm			19				
HMB Sub7 F	1mm	100	0	0	100	n		
HMB Sub7 F	.5mm	100	0	2	100	n		
HMB Sub7 F	.25mm	100	1	33	97	n		
HMB Sub7 G	1mm			6				
HMB Sub7 G	.5mm			2				

		QA #1					QA #2	
	Sieve	% of sample			% removed	Resort		Final
Station	Size	checked	# found	Original #	in first sort	Needed?		sort %
HMB Sub7 G	.25mm			38				
HMB Sub7 H	1mm			3				
HMB Sub7 H	.5mm			3				
HMB Sub7 H	.25mm			33				
HMB Sub7 I	1mm			6				
HMB Sub7 I	.5mm			7				
HMB Sub7 I	.25mm			68				
HMB Sub7 J	1mm			2				
HMB Sub7 J	.5mm			2				
HMB Sub7 J	.25mm			79				
HMB Sub8 A	1mm			0				
HMB Sub8 A	.5mm			1				
HMB Sub8 A	.25mm			274				
HMB Sub8 B	1mm			2				
HMB Sub8 B	.5mm			1				
HMB Sub8 B	.25mm			150				
HMB Sub8 C	1mm			1				
HMB Sub8 C	.5mm			0				
HMB Sub8 C	.25mm			353				
SB 1+0 A	1mm			0				
SB 1+0 A	.5mm			2				
SB 1+0 A	.25mm			148				
SB 1+0 B	1mm			1				
SB 1+0 B	.5mm			2				
SB 1+0 B	.25mm			121				
SB 1+0 C	1mm	100	0	1	100	n		
SB 1+0 C	.5mm	100	0	3	100	n		
SB 1+0 C	.25mm	100	12	207	95	n		
SB 1+4 A	1mm			2				
SB 1+4 A	.5mm			2				
SB 1+4 A	.25mm			71				
SB 1+4 B	1mm	100	0	3	100	n		
SB 1+4 B	.5mm	100	0	1	100	n		
SB 1+4 B	.25mm	100	0	48	100	n		
SB 1+4 C	1mm			2				
SB 1+4 C	.5mm			1				
SB 1+4 C	.25mm			59				
SB 1+8 A	1mm			18				
SB 1+8 A	.5mm			5				
SB 1+8 A	.25mm	100	0	73	100	n		
SB 1+8 B	1mm	100	0	21	100	n		
SB 1+8 B	.5mm	100	0	4	100	n		
SB 1+8 B	.25mm	100	5	68	93	y	0	100
SB 1+8 C	1mm			14				
SB 1+8 C	.5mm			4				
SB 1+8 C	.25mm	100	0	65	100	n		
SB 1+12 A	1mm			1				
SB 1+12 A	.5mm			0				

		QA #1					QA #2	
	Sieve	% of sample			% removed	Resort		Final
Station	Size	checked	# found	Original #	in first sort	Needed?		sort %
SB 1+12 A	.25mm			1				
SB 1+12 B	1mm			1				
SB 1+12 B	.5mm			1				
SB 1+12 B	.25mm			0				
SB 1+12 C	1mm			1				
SB 1+12 C	.5mm			0				
SB 1+12 C	.25mm			0				
SB 2+0 A	1mm			1				
SB 2+0 A	.5mm			1				
SB 2+0 A	.25mm	100	0	89	100	n		
SB 2+0 B	1mm	100	0	1	100	n		
SB 2+0 B	.5mm	100	0	4	100	n		
SB 2+0 B	.25mm	100	13	100	88	y	0	100
SB 2+0 C	1mm			0				
SB 2+0 C	.5mm			0				
SB 2+0 C	.25mm	100	1	100	99	n		
SB 2+4 A	1mm			4				
SB 2+4 A	.5mm			1				
SB 2+4 A	.25mm			10				
SB 2+4 B	1mm	100	0	2	100	n		
SB 2+4 B	.5mm	100	0	2	100	n		
SB 2+4 B	.25mm	100	0	23	100	n		
SB 2+4 C	1mm			3				
SB 2+4 C	.5mm			1				
SB 2+4 C	.25mm			28				
SB 2+8 A	1mm			27				
SB 2+8 A	.5mm			5				
SB 2+8 A	.25mm			70				
SB 2+8 B	1mm	100	0	12	100	n		
SB 2+8 B	.5mm	100	0	11	100	n		
SB 2+8 B	.25mm	100	0	21	100	n		
SB 2+8 C	1mm			29				
SB 2+8 C	.5mm			13				
SB 2+8 C	.25mm			42				
SB 2+12 A	1mm			0				
SB 2+12 A	.5mm			0				
SB 2+12 A	.25mm			2				
SB 2+12 B	1mm			0				
SB 2+12 B	.5mm			2				
SB 2+12 B	.25mm			3				
SB 2+12 C	1mm			0				
SB 2+12 C	.5mm			0				
SB 2+12 C	.25mm			7				

**Appendix C-2**  
**Verification of Polychaeta Voucher Collection**

Half Moon Bay and South Beach Benthic Invertebrates – Reference Collection					
Voucher Collection QA					
Species Verification Notes: Sheila Byers – Vancouver, BC – August 23, 2004					
Station	Taxon	Valid ID	Life Stage	No. obs.	Comments
HMB Sub 4A	Archiannelida	<i>Saccocirrus</i> spp.	A	4	<p>4 specimens- L ca 3-4 mm.</p> <p>Specimens correspond very closely with Beesley et al. (2000)'s. Fig 1.128, pp238. Eyes are black, obvious. Palps are papillated. Segs appear almost biannulate and parapodia are obvious. Midbody almost looks square in cross section. I believe there is a V, longit'l ciliated band. I also see golden? Sensory patches like those on palps of some Spionidae. The chaetae look like C (VERY long capillary-like w/ peculiar bifid tip) and E (tho this type looks broader and less defined in HMB sps); Type D chaetae are likely there, but the chaetae are difficult to see clearly (oil X). For whatever reason, the chaetae are most (only) apparent in a few middle segs of the body tho this could be an artifact of the sieving process.</p> <p>Specimens appear gravid. The pygidial lobes are conical, quite elongate w/ one edge (?inner) frilly (?papillae): internal tubes and pores, presumably for the adhesive secretions, are visible in each of the frills under compd X. In comparison, the pygidial lobes of <i>Protodrilus</i> are more complete, a seg w/ long D &amp; V slits (like blue jean cut-offs). Specimens of either of these genera can likely be distinguished w/ dissecting microscope; however, w/ confidence the occasional check by compd would confirm presence of chaetae. Preferred habitat is coarse intertidal and shallow subtidal sands.</p>
HMB Sub 4B	Archiannelida	<i>Saccocirrus</i> sp.	A J	8 3	All of these specimens have chaetae = <i>Saccocirrus</i> spp.: same as 4A above (6A + 2 post; 3J). Chaetae similar to D (fig 1.128) were visible in some of these. Also, those of type E appear to have the 2 prongs connected w/ the leading edge of the connector forked. Chaetae were observed in the posterior of one specimen. E chaetae not unlike those of <i>S. sonomacus</i> Martin but the capillary type don't really correspond. Some of these specimens are broken, likely because they are fragile due to being ripe w/ eggs. Martin 1977, Wieser 1957 and Purschke & Jouin 1988 might enable species level ID'n.
HMB Sub 5B	<i>Chaetozone</i> nr. <i>bansei</i>	<i>Chaetozone</i> <i>bansei</i>	A	1	<p>Confirm.</p> <p>1 large entire adult, L = 20 mm. Total sets ca 180.</p> <p>BEAUTIFUL specimen. Good for you!! You're right on the mark!! Considering the differences in size from that described by Blake 1996 I think these specimens correspond very well, particularly when relative proportions are taken into consideration. Moreover, there is no mistaking the MG pattern! Tentacles mid-dorsal on set 6+7. First branchiae on last peristomial annulation anterior to notosetae on set 1. V-shaped caruncle visible (unstained) dorsally extending posteriorly to tentacles. Neurosetae thick, broad w/ splayed fibrils on blade edge from set 1 thru to ca set 35; thereafter broad neurosetae are transitional to a narrower setae w/ long tapering tips (in addition to elongate capillaries) to set 64 where first blunt-tipped acicular setae occurs. Set 64 = 25% of the L of the worm. This corresponds to the occurrence of neuropodial spines at 23% of L in description in Blake 1996 (281). Spines increase to 4-5/fascicle and become curved as Fig. 8.4H. Notosetae short capillaries w/ elongate tips until ca set 60 shere they become much more elongate. Spines first appear on set 135 = 75% of L (ca 180 sets in total). Blake's specimen has noto spines ca 67%. Accompanying capillaries are ca = W of body. Pygidium w/ V cup-shaped lobe.</p>
			I or J	1	<p>1 immature specimen L = 5 mm. Total sets ca 94. Tentacles on set 1 + 2/3. Ant capillaries distinctly splayed. Neuropodial spines begin on set 17 (18% of L); notopodial spines at set 46 (49% of L).</p> <p>Prostomium/peristomium of this small specimen could be easily confused for <i>C. setosa</i>. MG stain, both specimens exactly as described in Blake w/ addition of small unstained (clear) 'nose' at tip of the prost.</p>

Half Moon Bay and South Beach Benthic Invertebrates – Reference Collection					
Voucher Collection QA					
Species Verification Notes: Sheila Byers – Vancouver, BC – August 23, 2004					
Station	Taxon	Valid ID	Life Stage	No. obs.	Comments
HMB Sub 7B	<i>Scoloplos</i> sp. or <i>Orbinia</i>	<i>Scoloplos armiger</i>	?	1	1 immature x L = ca 13 mm, posterior severed. Imm. based only on fact that L can reach 100 mm. This specimen is unquestionably <i>Scoloplos</i> , not <i>Orbinia</i> . There is only 1 large subpodial lobe or papillae beginning ca set 16-17 and continuing for about 13 sets into the ant abdominal sets. Otherwise there are NO stomach papillae, which would delineate <i>Orbinia</i> . The ribbed uncini or hooks are numerous and evident from neuropodia 1. I tend to agree w/ Mackie 1987 in that these specimens are a subspecies <i>alaskensis</i> of <i>S. armiger</i> . The uncini appear to me to be hooded, as opposed to Blake 1996 who suggests that the tips are smooth (w/o hood). If hooded, the authority would be (Hartman 1948) rather than (Muller 1776). The specimens agree in all other respects w/ Blake. Blake suggests that <i>S. armiger</i> is 'more typically found in continental shelf sed'ts while <i>S. acmeceps</i> is more typical of intertidal and shallow subtidal habitats'. I do not agree with this statement and the HMB specimens, depending on colln. depth, appear to support their occurrence in shallow subtidal habitats.
HMB Sub 8B	<i>Scoloplos</i> sp. or <i>Orbinia</i>	<i>Scoloplos armiger</i>	?	1	Same as above. Spines in thoracic neurosetae. Specimen exactly the same as that in 7B; subpodial lobes begin on set 15, running 9 sets. No stomach papillae (SP).
HMB Sub 7H	Opheliidae tiny	<i>Ophelia</i> spp.	J	1	Confirm. 1 tiny juvenile, L= 1.5 mm. Body typical of <i>Ophelia</i> , w/ 2 regions. Shape, Vgrose, pygidium all look right to me even if gills are not well developed.
HMB Sub 7E	Orbiniidae	<i>Scoloplos armiger</i>	A	1	1 immature, severed anterior L = ca 8 mm. Specimen exactly the same as that in 7B; subpodial lobes begin on set 15, running at least 8 sets. No SP.
HMB Sub 7D	Opheliidae	<i>Ophelia</i> spp.	J	1	Confirm. 1 small entire juvenile, L= 2 mm. Body grublike, w/ 2 regions: inflated, w/o Vgrose in anterior, w/ Vgrose from midbody thru to post end. Abranchiate sets preseed branchiate region, but gills too small to count. Pygidium w/ 2 V conical anal cirri, several DL cirri
HMB Sub 7D	Spionidae	<i>Spio ?butleri</i>	A	2	2 entire specimens, immature, L = 6, 9 mm; some midbody damage on one, otherwise beautiful specimens. Prostomium pointed, rounded at apex, conical over entire L + narrow lateral wings. Small 'caruncle' extends post to end of set 1; post portion is inflated. At least 3 prs black eyes. Branchiae begin on set 1 - no question - and are present thruout entire L of body. Branchiae are attached basally to notopodial lamellae (from set 1 onwards). In post the lamellae + branchiae are more dorsal in position and gradually reduce to a 'bifurcate' structure, tips equal in L until last few sets where branchiae becomes shorter than the lamellae. There are no accessory branchiae (ergo not <i>Dispio</i> ). Palps are grooved - flared base not especially evident. HHs first appearing in neuropodia on set 15, 17 respectively: hooks are distinctly bidentate, smaller tooth above main fang; teeth divergent. Slight hint on some hooks of tiny 3rd tooth but I believe this is an artifact of hood. HHs are accompanied by long thin capillaries to end of body. Also, 3-4 granular acicular setae w/ hooded, hooked tips, occur at lower part of neuropodial bundle to end of body. These acicular setae are the same as those described in specimen from 18G of April QA. HHs do not occur in the notosetae: the bundle of ca 12+ long capillary chaetae persist thruout L of body. Pygidium on smaller specimen w/ 4 conical anal cirri; lg'r dam'd specimen has at least 2 anal cirri evident. These are VERY difficult and confusing species w/ characteristics that seem to cross over between <i>Spio</i> and <i>Microspio</i> (see Maciolek 1990). This specimen is very similar to those from April colln that w/o a doubt were <i>S. butleri</i> . The HHs of this specimen,

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Voucher Collection QA					
Species Verification Notes: Sheila Byers – Vancouver, BC – August 23, 2004					
Station	Taxon	Valid ID	Life Stage	No. obs.	Comments
					however, are not parallel. But these specimens are only half the length of specimens described by B&B 1954, L = 25 mm. I am beginning to think these are juvenile <i>S. butleri</i> as dumping them back into <i>S. filicornis</i> does not work either (occurrence of neuropodial HHs falls between 2 species). Many more specimens of this group need to be examined to clarify characters based on growth/age. I have also heard the query as to whether the large parallel HHs of <i>S. butleri</i> are reproductive attributes. Unfortunately Maciolek does not provide a detailed description of <i>S. butleri</i> .
HMB Sub 7B	Hesionidae	<i>Microphtalmus</i> sp. (riojai?)	J	2	2 immatures, closer to A than J, L= 2, 3 mm; both w/ ca 30 sets. 2 long filiform ant; cannot discern a median ant; 2 prs of long filiform tC on each of the first 3 segs. Segs almost look biannulate particularly due to the 2 prs of small dark brown pigment patches laterally on each seg: 1 large on ant, 1 small on post of seg. Pigmented spots give the impression of 2 lateral long'l lines running the length of dorsum. Backgd colour of body is white, not golden. DC are short and conical while vC are similar in L to neuropodial lobe. Both w/ elongate annulations (squarish not roundish). Compd falcigers w/ butter-knife type of blades of 2 lengths, 1 about half L of the longer blade. Each blade is bifid, possibly tridentate. There is 1 major tooth w/ a smaller tooth on upper convex surface. Unable to clearly define a 3rd tooth on concave side of the main tooth. Blades w/ short, coarse teeth along L. Comb chaetae located in vicinity of dC; strongly curved over L w/ about 6-8 very long teeth (L teeth ca= 1/2L of 'comb' section). No notopodial needlesetae observed. Aciculae appear pointed, but not clearly visible. Pygidium w/ large broad & flat V disk (?w/ small mid-D notch). Sides of disk wrap slightly to dorsum to approximate area where 1 pr of anal cirri attach on lateral edges. The aC are thin, filiform and = or < L of the disk. HMB specimens do not correspond to those local species ID'd in Fournier 1991; nor those in Westheide 1967. A possible species is <i>M. riojai</i> Reish 1968 from CA, the reference to which I am trying to locate.
HMB Sub 5B	Orbiniidae	<i>Scoloplos armiger</i>	J	1	Confirm. 1 immature, entire specimen L = ca 6 mm. Specimen exactly the same as that in 7B; subpodial lobes begin around set 15, running about 5 sets. The subpodial lobes are there but very tiny and difficult to see. No stomach papillae (SP).
HMB 2+0A	Goniadiidae	<i>Glycinde armigera</i>	J	2	Confirm. 1 tiny entire specimen, L = 2 mm, 16 sets; 2nd specimen severed post only. Definite Goniadiidae juvenile: chevrons absent, 6 paragnaths present. Too small to get macro/micrognath distinctions. Dark brown spots of pigment already showing signs of faint transverse bands across dorsum of each seg. Goniadiidae Juv works but I see no reason not to take this to species considering the chevrons are clearly absent.
HMB 2+0D	Hesionidae	Hesionidae Juv	J	1	Confirm. 2 ant. (I cannot see median ant). Immediate thot is that the specimen looks to me to have 'those lobes' (pseudo-Vcirr) on the first few sets that are characteristic of <i>Micropodarke dubia</i> . The chaetae show some serration; however, the determination. I cannot determine the wherewithall of notosetae. The compd chaetae are, however, specimen is way too small for accurate characteristic of Hesionid w/ that abrupt terminal hook and vague straight latch. I cannot read the contracted proboscis. To my mind, it is undoubtedly a Hesionidae.

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Voucher Collection QA					
Species Verification Notes: Sheila Byers – Vancouver, BC – August 23, 2004					
Station	Taxon	Valid ID	Life Stage	No. obs.	Comments
HMB 2+0D	<i>Eteone</i> sp.	Syllidae	J	1	It is not <i>Microphthalmus</i> , however. If you want, ? <i>Micropodarke dubia</i> juv might work. 1 juvenile, 6 sets There are 2 prs of tC on ant of prostomium, a definite indicator of <i>Eteone</i> . The roundness of the D & V cirri are evident, vaguely at low power but better at compd X. The joint articulation of the blade and shaft show 2 pronounced teeth, something I have never been able to comfortably see in adults. And finally, there are 2 rounded anal cirri.
HMB 2+0D	Polychaete (Spionidae)	Nephtyidae Juv	J	1	1 entire juvenile, L = < 1 mm, 10 sets Cute little guy w/ tan colour prostomium and pygidium against a beige body backgd. Strong orangy brown pigment on prostomium in no discernable pattern; pigment encircles pygidium as a wide band. There is 1 pr of black eyes pre set 1. Antennae are yet undeveloped; there are small cirri-like stubs on the parapodial but nothing specifically discernable. Most important is the fenestrated chaetae characteristic of the Nephtyidae. There is also 1 long filiform anal cirrus, centrally, ventrally inserted. These plus the 2 pigmented areas may serve as an easy ID'n key to juveniles of this family. Tho these are likely <i>Nephys</i> , ID'n to genus is marginal w/o evidence of shape of interramal cirri.
HMB 2+0H	Polychaeta	?Opheliidae juv	J	1	1 tiny entire juvenile L = 1 mm, 22 sets. At least 3 eyes present. A tiny palpode on prost. Distinct noto & neuropodia; chaetae long, simple capillaries, > 1/2 width of the body. Pygidium w/ a rounded pair of lobes and 1 long thin cirrus emerging centrally from these lobes. I'm stumped on this: pygidium suggests Nephtyidae to me but there are no fenestrated setae, yet the 1 mm specimen in 13 above shows these. My best guess is Opheliidae juvenile given eyes, palpode and long capillary setae.
HMB 2+4B	Orbiniidae	<i>Scoloplos</i> spp.	J	1	Confirm. 2 tiny entire juveniles, L ca 1 mm, 10-14 sets. Tiny as these are, both specimens have 1 modified uncini in set 1, visible only under oli. However, they are way too small to ID to species level.
HMB Sub 8A	<i>Ophelia</i> sp.	<i>Ophelia limacina</i>	J	1	Confirm. 1 immature, entire specimen, L = 6 mm. Total setigers = ?34: 11 ant abranchiate + 15 branchiate + 5 post abranchiate + ?3 achaetous (as best I can discern). The 11 ant abranchiate is a bit odd (I have triple checked this) since 9 or 10 seem to be the deciding factor delineating species. Otherwise this specimen is virtually identical to those specimens from the first (15 Apr 04) colln, codes 10E & 12L. Having reread my species notes for both of these sps I am still plagued by the similarity of these specimens to <i>Ophelia assimilis</i> in Blake (2000:155), especially knowing that the type specimens of <i>O. limacina</i> are from Norway. The # of body segs - 33- correspond to <i>O. assimilis</i> tho <i>O. limacina</i> provides a greater range - 33 to 40 (Hobson & Banse 1981). The reservations mentioned in the notes still remain. So for consistency and until such time as synonymy is absolutely determined (many specimens examined) I will leave the taxon name as <i>O. limacina</i> .
HMB Sub 7G	Hesionidae ? <i>Microphthalmus</i> sp.	<i>Microphthalmus</i> sp.	A	1	1 entire adult, L= 4 mm. Pigmentation patches on this specimen are very pronounced. Beautiful comb chaetae. In all respects this specimen is exactly the same as the <i>M. riojai</i> specimens of Sub 7B spl above.
HMB Sub 7H	Orbiniidae	<i>Scoloplos armiger</i>	J	1	Confirm. 1 immature, almost entire specimen L = ca 10 mm.

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Voucher Collection QA					
Species Verification Notes: Sheila Byers – Vancouver, BC – August 23, 2004					
Station	Taxon	Valid ID	Life Stage	No. obs.	Comments
					Specimen exactly the same as that in 7B; subpodial lobes begin on set 15, running at least 4-5 sets. Specimen not in that great shape and difficult to see all subpodial lobes. No stomach papillae (SP).
HMB Sub 7H	Glyceridae	Glycera spp.	J	1	Confirm. 1 immature specimen w/ head severed but proboscis present. L = 8 mm. Jaw structure, specifically ailerons, of <i>Glycera</i> species. Ant-most segs triannulate suggesting <i>G. nana</i> but would probably stay w/ genus only given the presence of other <i>G. macrobranchia</i> in April colln.
HMB Sub 2A	Archiannelida A now defunct taxon (Rouse & Pleijel 2001)	Canalipalpata Protodrilida immature juveniles	J	8	<p><b>CONFIRM?</b></p> <p>8 entire specimens examined under oil, L ca= 2 mm.</p> <p>Specimens are very small, long and thin!! They are at least 6 times narrower than the width of the mature Aug specimens of <i>Saccocirrus</i>. My logic for March/April ID'n: suggested <i>Protodrilus flabelliger</i>. This was based on literature I had in hand. Kozloff Fig 131 was where I started because it had a key. Fig 131 was referenced ONLY because the overall features of the HMB specimens corresponded. However, as noted, I did not see any setae, which would suggest <i>Saccocirrus</i>. So I keyed specimens out to Protodrilidae. The family key gave only 1 choice, that of <i>P. flabelliger</i>. I did not, however, have any more references at that time, e.g. Nordheim 1989. Perhaps it wasn't wise to go the distance, tho I did qualify it by "suggest" <i>P. flabelliger</i>, particularly now that I have seen size variation between immature and mature specimens. However, in retrospect <i>P. flabelliger</i> is 1 species that Nordheim (1989) tabulates as being recorded from Seattle, Puget Sd. - in coarse sand, intertidal 'between four + six foot level'.</p> <p>By comparison, the Aug QA (June colln) specimens of <i>Saccocirrus</i> are unmistakeable, and huge in comparison. Their setae were evident and clear (100x), tho difficult to see in detail.</p> <p>Re-examination of 8 March specimens: W/o hesitation I now draw back from species or even family ID for the March specimens 'suggested' as <i>P. flabelliger</i>. I still cannot clearly distinguish setae. What I think MIGHT be setae, at 100x oil, are so small that I cannot discern whether or not I am looking at long setae, sensory cilia (Nordheim, Fig 3A), or ciliation of the trunk segments (Fig 3B). If setae = <i>Saccocirrus</i> (depending on the setal shape); if either of Fig 3 A or B are real = <i>Protodrilus</i>. So in that sense I cannot rule out the presence of <i>Protodrilus</i> in the colln but neither can I confirm that these specimens are <i>Saccocirrus</i> - just TOO small. Unless you are prepared to mount and examine each and every one of these immature specimens - an inordinate amount of time spent on the compd!! - in hopes of sorting out who they are, it is unsafe to ID these smaller specimens even to family. Good call, Sandy!</p> <p>Some natural history notes in Rouse &amp; Pleijel 2001 (284):</p> <ul style="list-style-type: none"> <li>*groups such as <i>Protodrilus</i> and <i>Saccocirrus</i> are found in medium to coarse sediments in shallow waters.</li> <li>*most Protodrilidae have been described from European waters; the exception is <i>Saccocirrus</i> where most taxa have been described from warmer waters around the world.</li> <li>*Protodrilida prefer sand flats or extensive sand slopes in low-energy sea shores and subtidal areas</li> <li>*w/ exception of <i>Protodrilus</i> little is known about the behaviour or ecology of Protodrilida.</li> <li>*<i>Protodrilus</i> appears to have a life span of ca 1 yr, main breeding period in the summer months.</li> </ul>

Half Moon Bay and South Beach Benthic Invertebrates – Reference Collection					
Voucher Collection QA					
Species Verification Notes: Sheila Byers – Vancouver, BC – August 23, 2004					
Station	Taxon	Valid ID	Life Stage	No. obs.	Comments
HMB Sub 4A	Terebellidae	Terebellidae	J	1	Immature juvenile w/ severed abdomen, L = 1 mm incl tentacles. ca 13 notosetae present, set 1 & 2 w/o uncini; ca 11 uncinigerous sets beginning on set 3 (seg 6); in dbl row by unciniger 6 or 7 branchiae absent; tentacles everted; 2 clusters of small eyespots uncini are not unlike those of Lanassa species' w/ the broad base; however, specimen too small to confirm type or shape of notosetae.
HMB Sub 7I	Terebellidae	Terebellidae Juv	J	1	1 entire juvenile, 11 sets, L = 1 mm incl tentacles. 11 notosetae present, set 1 & 2 w/o uncini; uncinigers beginning on set 3 (seg 6); in dbl row by unciniger 6 too small to attempt further resolution.
HMB Sub 4C	Chrysopetalidae	<i>Paleanotus bellis</i>	J	1	<b>CONFIRM?</b> 1 entire juvenile, 8 setigers, L < 0.5 mm. 4 eyes clearly in square arrangement. Specimen has 2 distinct types of notosetae: upper board, distally dilated, and overlapping on dorsum; lower w/ narrow, butterknife blades tapering distally, as in Hartman 1968 (187). Compd falcigers w/ coarse teeth; vC noticeably beaded (dC not readily visible) No hesitation w/ this species ID in spite of the size of the juvenile.
HMB Sub 7C	<i>Magelona</i> sp.	<i>Magelona sacculata</i>	A	1	1 adult w/ far posterior severed, L = 20 mm. Beautiful specimen, very gravid. Prost long, w/o lateral frontal horns, proboscis everted. Set 9 provides a distinct transition from ant 8 and those posterior; lateral pouches between set 10-11. Setae on set 9 special w/ mucronate tips. HHs w/ tridentate tips. Examined several parapodia and found no miniature HHs at base of lateral lamellae. Recorded from silt or fine sands: inner cont'l shelf depths to about 50 m. Distr'n c & sCA but I'm pretty sure there are unpublished records of this from BC. Val might have it on her dB.
HMB 4+4A	<i>Euzonus</i> sp.	<i>Euzonus</i> sp.	A	1	1 entire adult, L = 11 mm. Good but small immature specimen, at least given the length. Only new news is that on this round I have determined that the key in Blake 2000 (149) does not correspond w/ the content of Fig 7.2. According to the key, Fig 7.2C = <i>E. mucronata</i> ; Fig 7.2D = <i>E. williamsi</i> ; Fig 7.2E = <i>E. illonensis</i> . Based on branchiae alone I would ID this specimen as <i>E. williamsi</i> , w/o a doubt. And as per the Mar/Apr QA specimens the pygidium is the problem. HMB 4 + 4A has a pygidium that looks like it should be <i>E. mucronata</i> (Fig 7.2F). In looking at Hartman 1969 (325-329), Blake seems to have followed her descriptions of the 3 species. However, the only figure showing a pygidium of <i>E. dillonensis</i> is a side view and totally useless in terms of seeing 2 thick V cirri. So, we are back to square one - which is no reliable species ID'n. At some point I will try to locate Hartman 1938 for any clarification. <i>E. williamsi</i> is generally higher in intertidal zone than <i>E. mucronata</i> .

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**APPENDIX D**

**GRAIN SIZE ANALYSIS RESULTS**



## LETTER OF TRANSMITTAL

**Date:** July 22, 2004                   **Job No.:** J-04-2011

**TO:** SAIC  
John Nakayama  
18706 North Creek Parkway  
Suite 110  
Bothell, WA 98011

**Reference:** Half Moon Bay  
Purchase Order No. 4400094695

We are sending the following items:

Date	Description
7/22/04	Invoice No. 42413
7/22/04	Particle Size Distribution Report (Plates 1 through 10)

These are transmitted for your use.

**Remarks:**

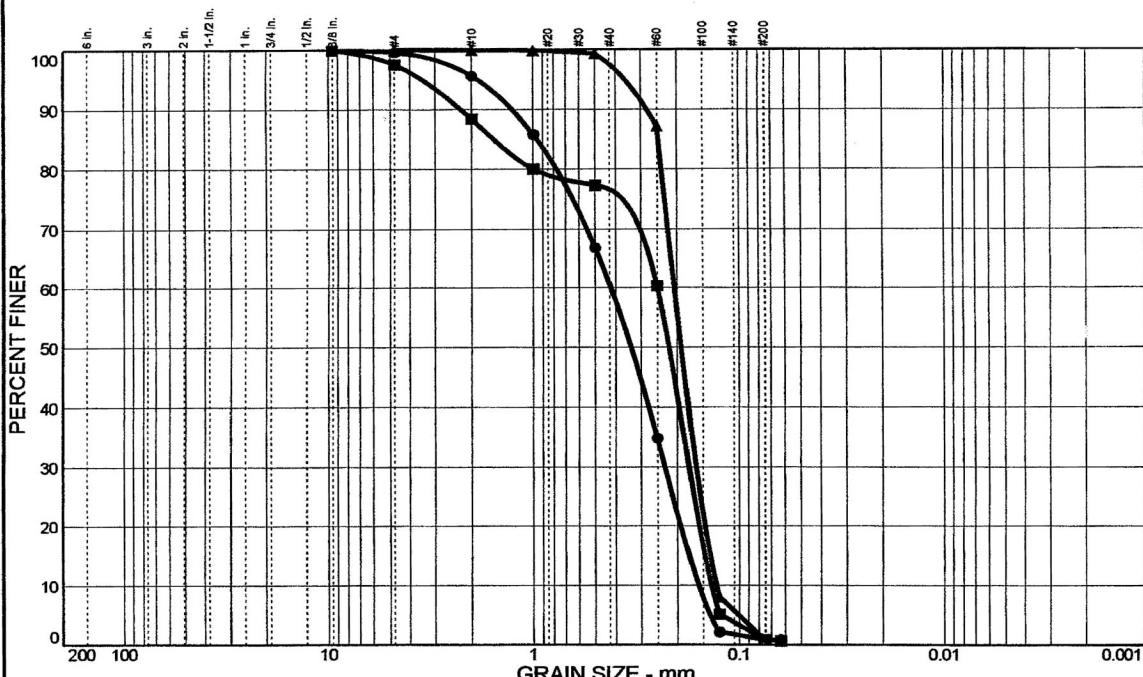
Testing was performed in general accordance with ASTM D-422. If you should have any questions about the data presented herein please do not hesitate to contact Soil Technology's project manager, Anthony Parkins. Thank you for using Soil Technology's laboratory services. It is always a pleasure working with SAIC and we would be happy to serve you further in providing laboratory testing for your projects.

Best Regards,  
SOIL TECHNOLOGY

A handwritten signature in black ink that reads "Kristin A. Sheets".

Kristin A. Sheets,  
President

# Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
●	0.4	98.8	0.8		SP			
■	2.5	96.7	0.8		SP			
▲		99.2	0.8		SP			

SIEVE inches size	PERCENT FINER		
	●	■	▲
.375	100.0	100.0	

SIEVE number size	PERCENT FINER		
	●	■	▲
#4	99.6	97.5	100.0
#10	95.6	88.4	100.0
#18	85.8	80.0	99.9
#35	66.8	77.3	99.3
#60	34.8	60.3	87.2
#120	2.1	5.1	8.0
#200	0.8	0.8	0.8
#230	0.8	0.7	0.8

#### GRAIN SIZE

D <sub>60</sub>	0.420	0.249	0.206
D <sub>30</sub>	0.230	0.175	0.162
D <sub>10</sub>	0.158	0.137	0.129

#### COEFFICIENTS

C <sub>c</sub>	0.80	0.90	0.98
C <sub>u</sub>	2.66	1.82	1.59

● Source: HMBSUB

■ Source: HMBSUB

▲ Source: HMBSUB

Sample No.: 1

Sample No.: 2

Sample No.: 3

#### SOIL DESCRIPTION

● Poorly graded sand

■ Poorly graded sand

▲ Poorly graded sand

#### REMARKS:

● Classification based on grainsize only

■ Classification based on grainsize only

▲ Classification based on grainsize only

**SOIL TECHNOLOGY, INC.**

Client: SAIC

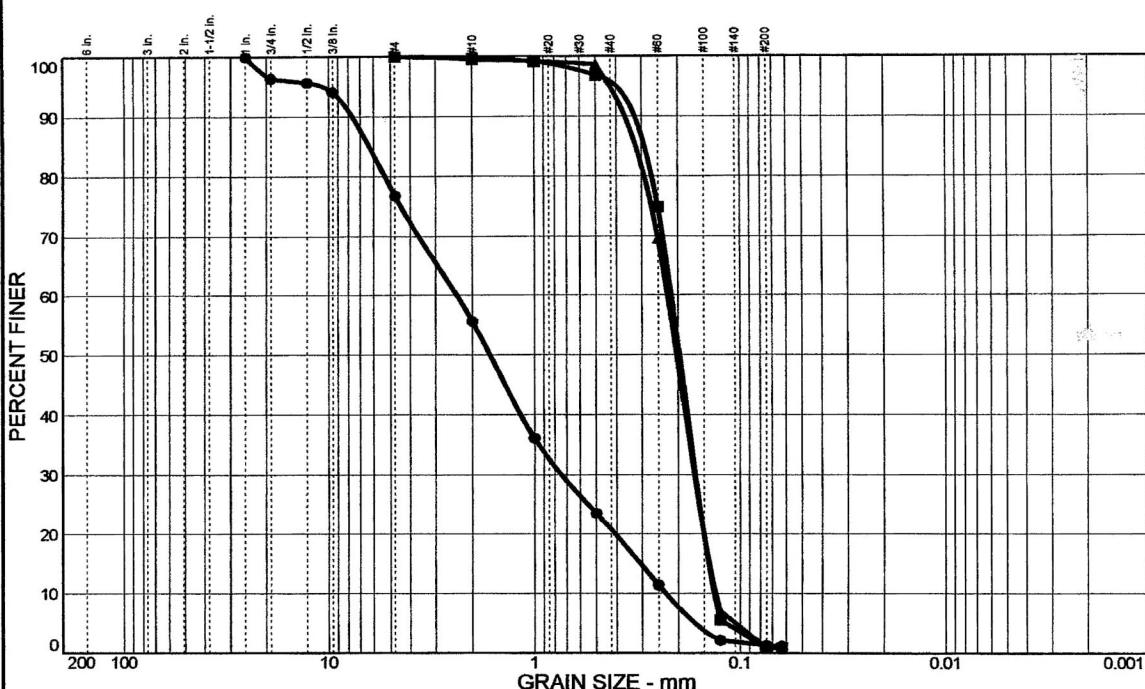
Project: Half Moon Bay & South Beach Sampling June 2004

Project No.: 04-2011

Plate

1

# Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
●	23.2	75.5		1.3	SW			
■		99.1		0.9	SP			
▲		99.1		0.9	SP			

SIEVE inches size	PERCENT FINER		
	●	■	▲
1	100.0		
.75	96.3		
.5	95.6		
.375	94.0		

GRAIN SIZE			
D <sub>60</sub>	2.37	0.215	0.224
D <sub>30</sub>	0.742	0.165	0.167
D <sub>10</sub>	0.231	0.134	0.132

COEFFICIENTS			
C <sub>C</sub>	1.01	0.95	0.94
C <sub>U</sub>	10.30	1.60	1.70

● Source: HMBSUB

■ Source: HMBSUB

▲ Source: HMBSUB

SIEVE number size	PERCENT FINER		
	●	■	▲
#4	76.8	100.0	100.0
#10	55.6	99.7	99.5
#18	36.1	99.1	99.2
#35	23.5	96.8	98.6
#60	11.4	74.9	69.6
#120	2.1	5.5	7.0
#200	1.3	0.9	0.9
#230	1.2	0.8	0.8

SOIL DESCRIPTION
● Well-graded sand with gravel
■ Poorly graded sand
▲ Poorly graded sand

REMARKS:
● Classification based on grainsize only
■ Classification based on grainsize only
▲ Classification based on grainsize only

Sample No.: 4

Sample No.: 5

Sample No.: 6

**SOIL TECHNOLOGY, INC.**

Client: SAIC

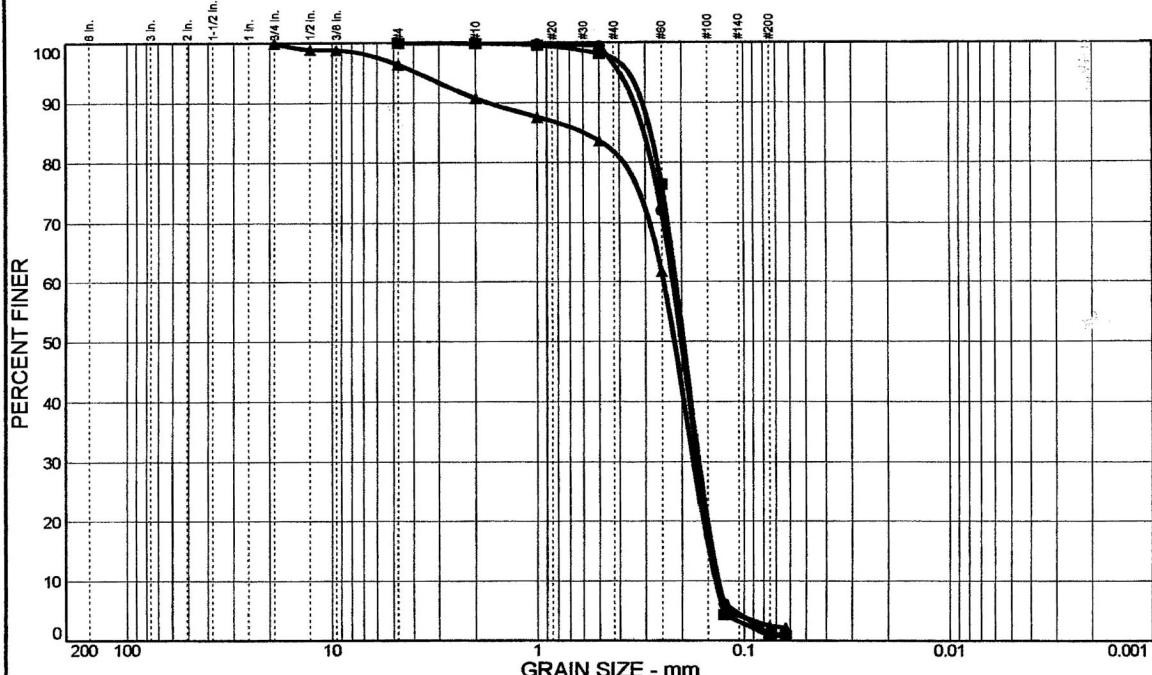
Project: Half Moon Bay & South Beach Sampling June 2004

Project No.: 04-2011

Plate

2

# Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
●		98.9		1.1	SP			
■		99.2		0.8	SP			
▲	3.7	93.9		2.4	SP			

SIEVE inches size	PERCENT FINER		
	●	■	▲
.75			100.0
.375			98.9
			98.8

GRAIN SIZE			
D <sub>60</sub>	0.220	0.213	0.244
D <sub>30</sub>	0.167	0.166	0.175
D <sub>10</sub>	0.133	0.136	0.138

COEFFICIENTS			
C <sub>c</sub>	0.95	0.95	0.92
C <sub>u</sub>	1.65	1.57	1.77

● Source: HMBSUB

■ Source: HMBSUB

▲ Source: HMB

SIEVE number size	PERCENT FINER		
	●	■	▲
#4	100.0	100.0	96.3
#10	99.9	99.9	90.7
#18	99.8	99.6	87.6
#35	99.5	98.1	83.6
#60	72.0	76.4	61.8
#120	6.1	4.3	4.9
#200	1.1	0.8	2.4
#230	1.0	0.8	2.1

## SOIL DESCRIPTION

● Poorly graded sand

■ Poorly graded sand

▲ Poorly graded sand

## REMARKS:

● Classification based on grainsize only

■ Classification based on grainsize only

▲ Classification based on grainsize only

Sample No.: 7

Sample No.: 8

Sample No.: 2+0

**SOIL TECHNOLOGY, INC.**

Client: SAIC

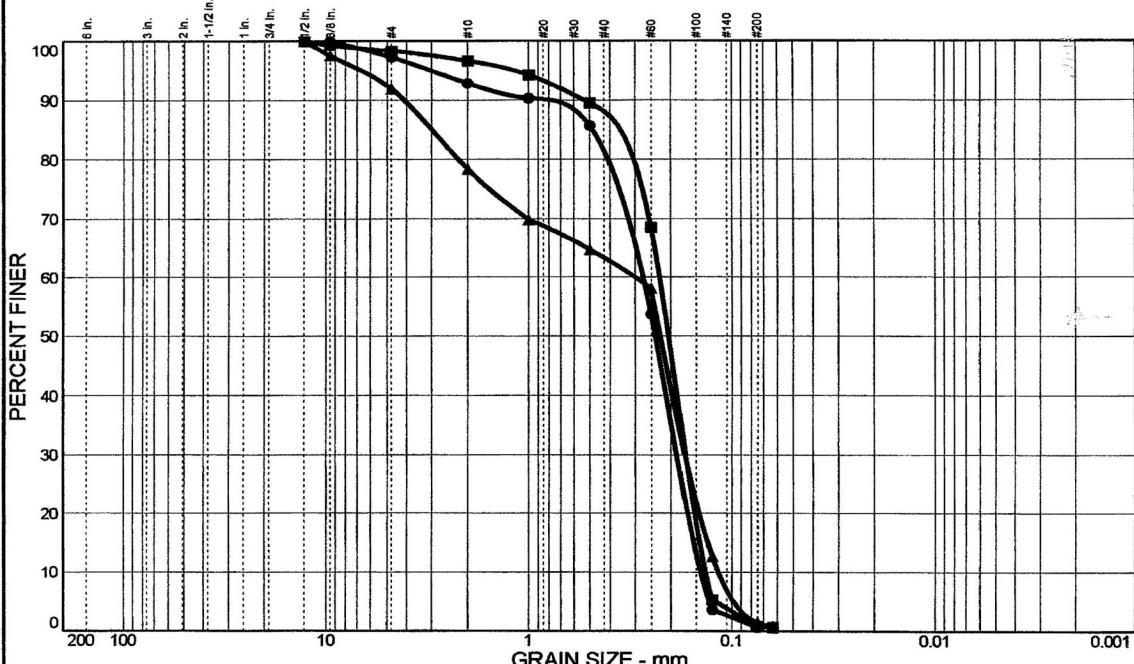
Project: Half Moon Bay & South Beach Sampling June 2004

Project No.: 04-2011

Plate

3

# Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
●	2.8	96.5	0.7		SP			
■	1.7	97.5	0.8		SP			
▲	8.1	90.5	1.4		SP			

SIEVE inches size	PERCENT FINER		
	●	■	▲
.5 .375	100.0	99.3	97.5

GRAIN SIZE			
D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	
0.273	0.226	0.301	
0.187	0.169	0.170	
0.143	0.135	0.117	

COEFFICIENTS			
C <sub>c</sub>	C <sub>u</sub>		
0.90	0.93	0.83	
1.91	1.68	2.57	

SIEVE number size	PERCENT FINER		
	●	■	▲
#4	97.2	98.3	91.9
#10	92.8	96.6	78.4
#18	90.3	94.2	69.8
#35	85.7	89.5	64.7
#60	53.7	68.5	58.1
#120	3.6	5.3	12.7
#200	0.7	0.8	1.4
#230	0.7	0.7	0.8

SOIL DESCRIPTION		
●	Poorly graded sand	
■	Poorly graded sand	
▲	Poorly graded sand	

REMARKS:		
●	Classification based on grainsize only	
■	Classification based on grainsize only	
▲	Classification based on grainsize only	

● Source: HMB

■ Source: HMB

▲ Source: HMB

Sample No.: 2+4

Sample No.: 3+0

Sample No.: 3+4

**SOIL TECHNOLOGY, INC.**

Client: SAIC

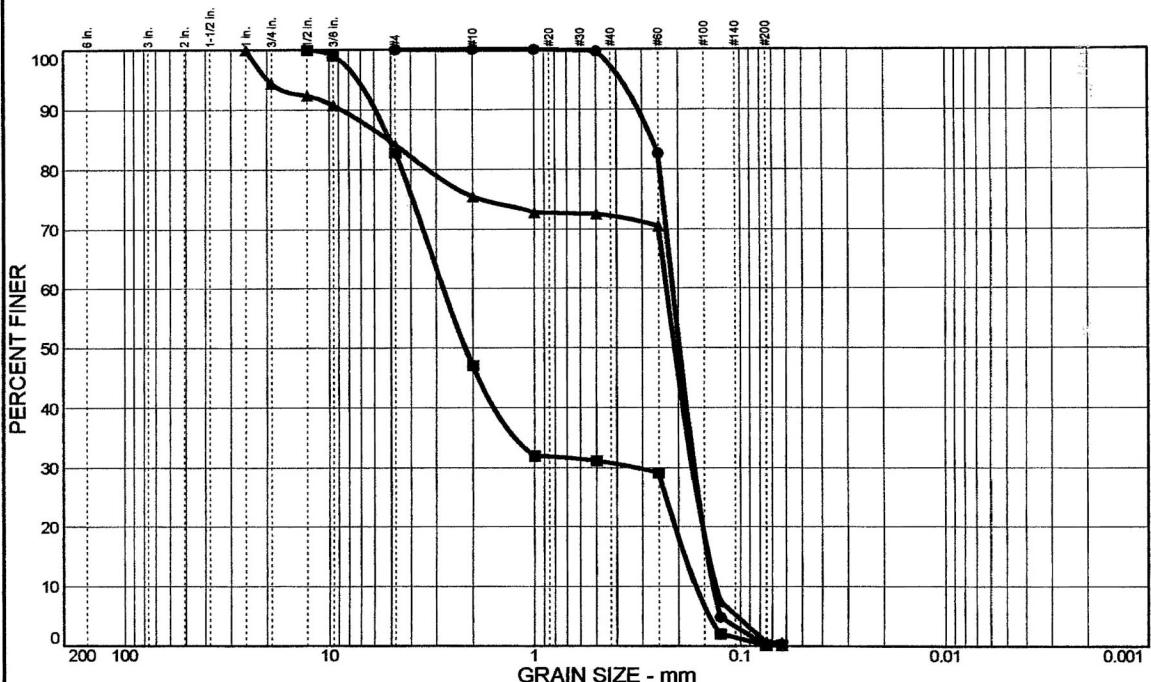
Project: Half Moon Bay & South Beach Sampling June 2004

Project No.: 04-2011

Plate

4

# Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
●		99.9	0.1		SP			
■	17.2	82.6	0.2		SP			
▲	15.9	83.4	0.7		SP			

SIEVE inches size	PERCENT FINER		
	●	■	▲
1			100.0
.75			94.4
.5		100.0	92.3
.375		99.0	90.7
<hr/>			
GRAIN SIZE			
D <sub>60</sub>	0.212	2.77	0.228
D <sub>30</sub>	0.168	0.325	0.171
D <sub>10</sub>	0.136	0.165	0.132
<hr/>			
COEFFICIENTS			
C <sub>c</sub>	0.97	0.23	0.98
C <sub>u</sub>	1.56	16.82	1.73

SIEVE number size	PERCENT FINER		
	●	■	▲
#4	100.0	82.8	84.1
#10	100.0	47.0	75.5
#18	100.0	31.9	72.8
#35	99.7	31.1	72.5
#60	82.6	29.1	70.5
#120	4.8	2.0	7.4
#200	0.1	0.2	0.7
#230	0.1	0.2	0.6

#### SOIL DESCRIPTION

- Poorly graded sand
- Poorly graded sand with gravel
- ▲ Poorly graded sand with gravel

#### REMARKS:

- Classification based on grainsize only
- Classification based on grainsize only
- ▲ Classification based on grainsize only

- Source: HMB
- Source: HMB
- ▲ Source: HMB

Sample No.: 3+8

Sample No.: 4+0

Sample No.: 4+4

Client: SAIC

Project: Half Moon Bay & South Beach Sampling June 2004

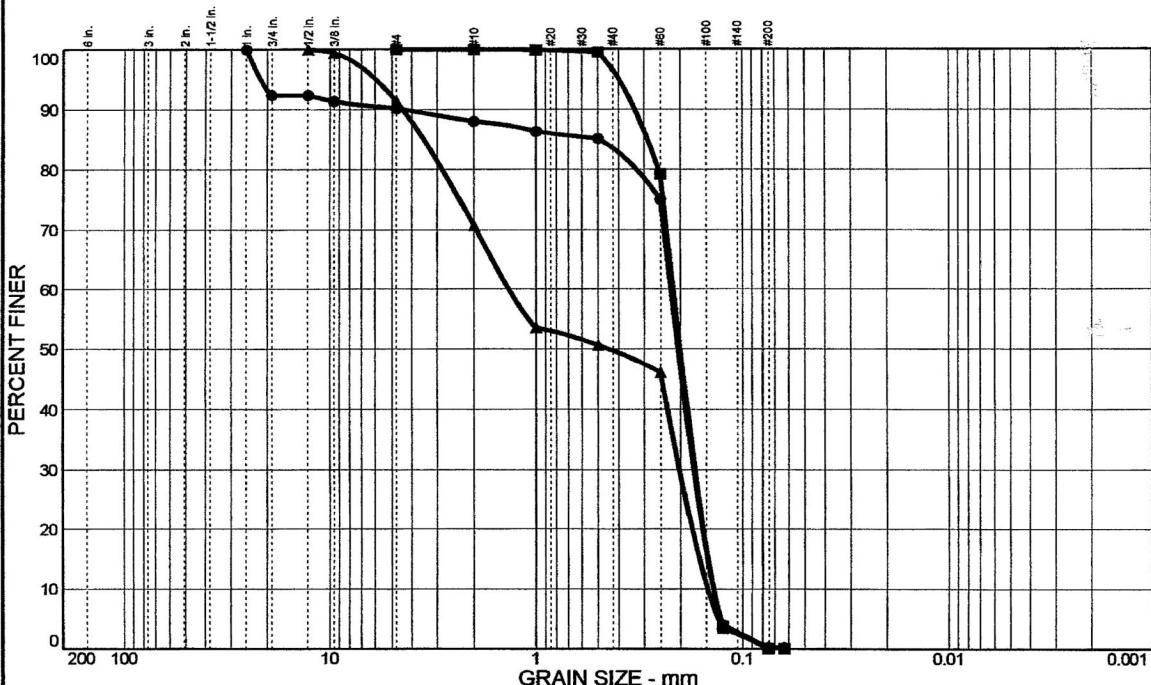
Project No.: 04-2011

Plate

5

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# Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
●	9.9	89.9	0.2		SP			
■		99.9	0.1		SP			
▲	8.7	90.9	0.4		SP			

SIEVE inches size	PERCENT FINER		
	●	■	▲
1	100.0		
.75	92.3		
.5	92.3		100.0
.375	91.3		99.4

GRAIN SIZE			
D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	
0.222	0.216	1.35	
0.173	0.170	0.203	
0.139	0.138	0.148	

COEFFICIENTS			
C <sub>c</sub>	C <sub>u</sub>		
0.97	0.97	0.21	
1.60	1.56	9.16	

● Source: HMB

■ Source: HMB

▲ Source: HMB

Sample No.: 4+8

Sample No.: 4+12

Sample No.: 5+0

**SOIL TECHNOLOGY, INC.**

Client: SAIC

Project: Half Moon Bay & South Beach Sampling June 2004

Project No.: 04-2011

Plate

6

SIEVE number size	PERCENT FINER		
	●	■	▲
#4	90.1	100.0	91.3
#10	88.0	100.0	70.7
#18	86.3	99.9	53.5
#35	85.1	99.5	50.6
#60	75.1	79.2	46.1
#120	4.0	3.7	3.4
#200	0.2	0.1	0.4
#230	0.2	0.1	0.2

## SOIL DESCRIPTION

● Poorly graded sand

■ Poorly graded sand

▲ Poorly graded sand

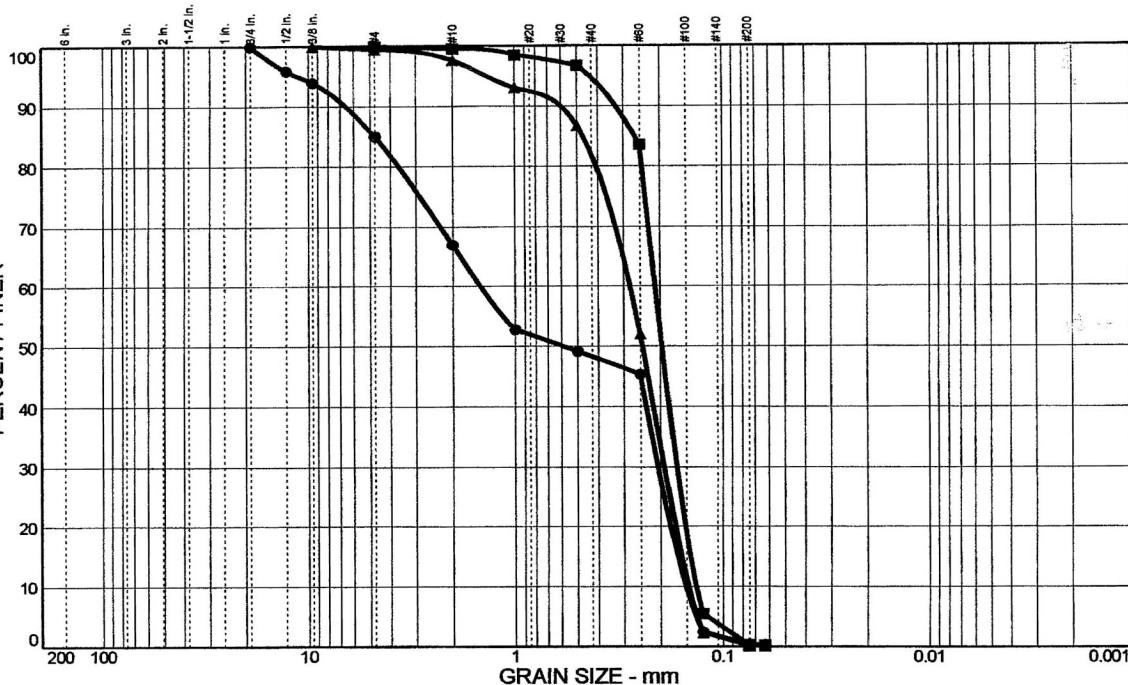
## REMARKS:

● Classification based on grainsize only

■ Classification based on grainsize only

▲ Classification based on grainsize only

# Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
●	15.0	84.6		0.4	SP			
■		99.7		0.3	SP			
▲	0.5	99.3		0.2	SP			

SIEVE inches size	PERCENT FINER		
	●	■	▲
.75	100.0		
.5	95.8		
.375	93.9		100.0

SIEVE number size	PERCENT FINER		
	●	■	▲
#4	85.0	100.0	99.5
#10	66.9	99.6	97.6
#18	52.7	98.5	93.0
#35	49.1	96.7	86.7
#60	45.3	83.6	52.0
#120	2.4	5.4	2.3
#200	0.4	0.3	0.2
#230	0.3	0.2	0.2

GRAIN SIZE			
D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	Coefficients
1.47	0.211	0.279	
0.206	0.167	0.192	
0.151	0.135	0.147	
COEFFICIENTS			
C <sub>c</sub>	0.19	0.98	0.90
C <sub>u</sub>	9.73	1.57	1.90

● Source: HMB

■ Source: HMB

▲ Source: HMB

Sample No.: 5+4

Sample No.: 5+8

Sample No.: 5+12

## SOIL DESCRIPTION

● Poorly graded sand with gravel

■ Poorly graded sand

▲ Poorly graded sand

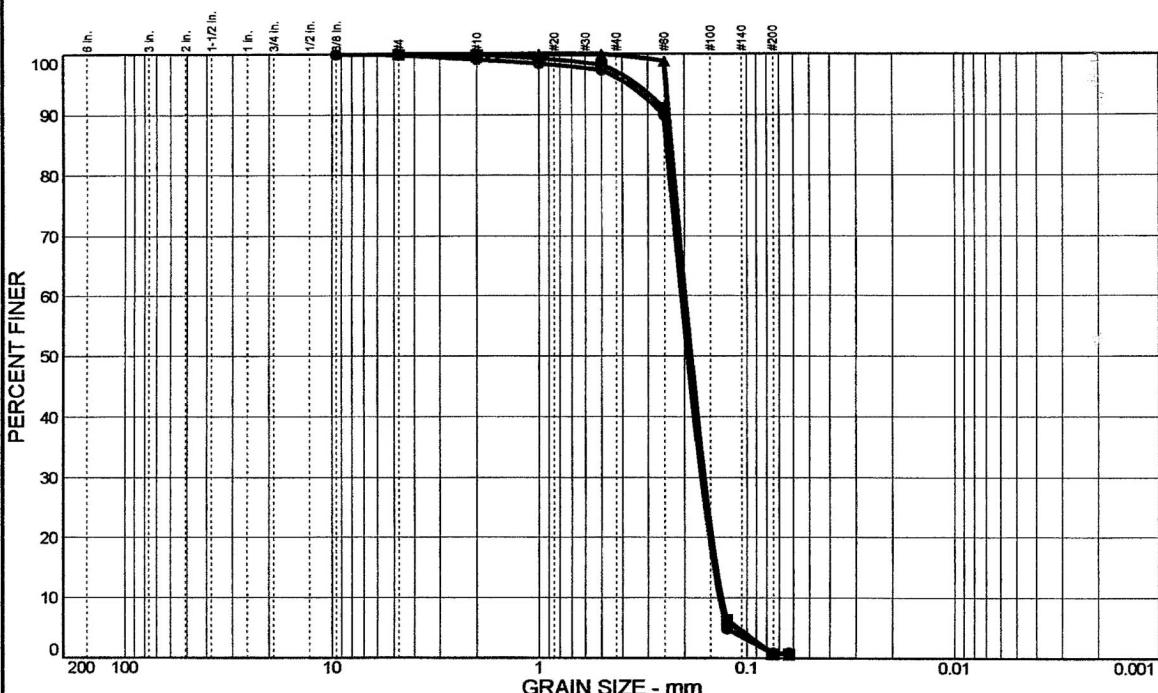
## REMARKS:

● Classification based on grainsize only

■ Classification based on grainsize only

▲ Classification based on grainsize only

# Particle Size Distribution Report

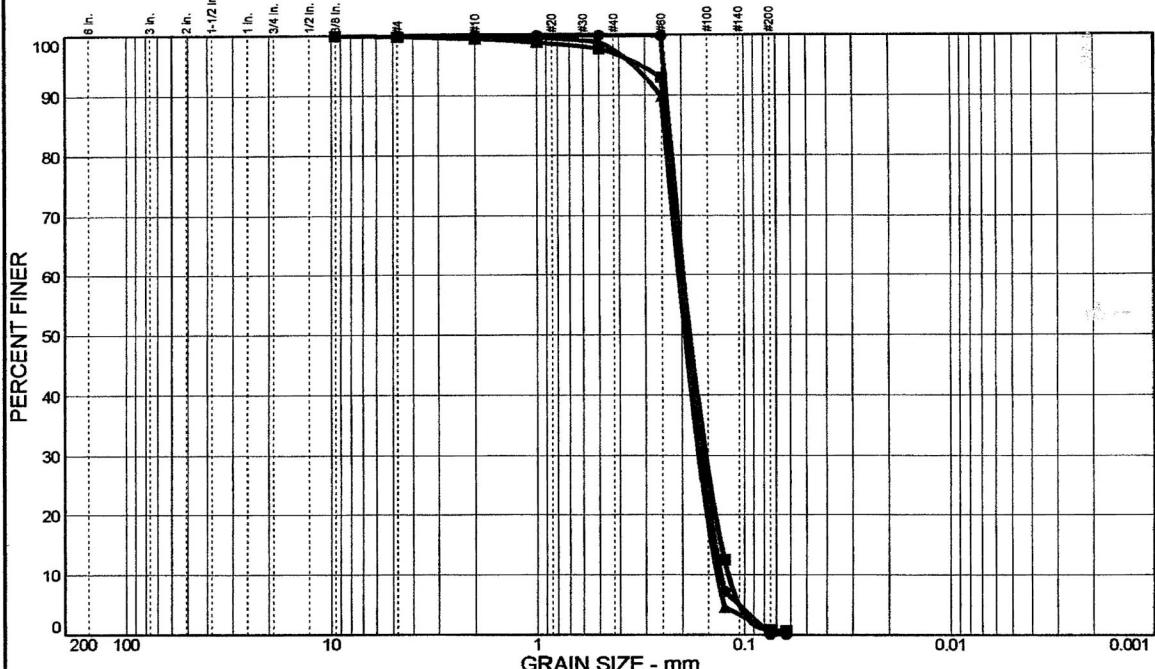


% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
●	0.1	99.1		0.8	SP			
■		99.3		0.7	SP			
▲		99.2		0.8	SP			

SIEVE inches size	PERCENT FINER			SIEVE number size	PERCENT FINER			SOIL DESCRIPTION		
	●	■	▲		●	■	▲			
.375	100.0			#4	99.9	100.0	100.0	● Poorly graded sand		
<hr/>										
D <sub>60</sub>	0.206	0.204	0.198	#10	99.1	99.9	100.0	■ Poorly graded sand		
D <sub>30</sub>	0.165	0.163	0.161	#18	98.4	99.3	100.0			
D <sub>10</sub>	0.135	0.132	0.133	#35	97.3	98.2	100.0			
<hr/>										
<b>GRAIN SIZE</b>										
D <sub>60</sub>	0.206	0.204	0.198	#60	89.9	91.0	98.8			
D <sub>30</sub>	0.165	0.163	0.161	#120	4.8	6.3	6.0			
D <sub>10</sub>	0.135	0.132	0.133	#200	0.8	0.7	0.8			
<hr/>										
<b>COEFFICIENTS</b>										
C <sub>c</sub>	0.98	0.98	0.99	#230	0.8	0.7	0.8			
C <sub>u</sub>	1.52	1.54	1.49							
● Source: SB								REMARKS:		
■ Source: SB								● Classification based on grainsize only		
▲ Source: SB								■ Classification based on grainsize only		
									▲ Classification based on grainsize only	

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	Project: Half Moon Bay & South Beach Sampling June 2004
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# Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
●		99.9		0.1	SP			
■	0.2	99.0		0.8	SP			
▲		99.3		0.7	SP			

SIEVE inches size	PERCENT FINER		
	●	■	▲
.375		100.0	

SIEVE number size	PERCENT FINER		
	●	■	▲
#4	100.0	99.8	100.0
#10	100.0	99.4	100.0
#18	100.0	98.8	99.6
#35	100.0	97.7	98.9
#60	99.9	92.9	89.8
#120	7.2	12.5	4.6
#200	0.1	0.8	0.7
#230	0.1	0.7	0.7

GRAIN SIZE			
D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	Coefficients
0.196	0.197	0.206	
0.159	0.154	0.165	
0.130	0.120	0.136	
COEFFICIENTS			
C <sub>c</sub>	0.99	1.00	0.98
C <sub>u</sub>	1.51	1.65	1.52

● Source: SB

■ Source: SB

▲ Source: SB

Sample No.: 1+12

Sample No.: 2+0

Sample No.: 2+4

## SOIL DESCRIPTION

● Poorly graded sand

■ Poorly graded sand

▲ Poorly graded sand

## REMARKS:

● Classification based on grainsize only

■ Classification based on grainsize only

▲ Classification based on grainsize only

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Client: SAIC

Project: Half Moon Bay & South Beach Sampling June 2004

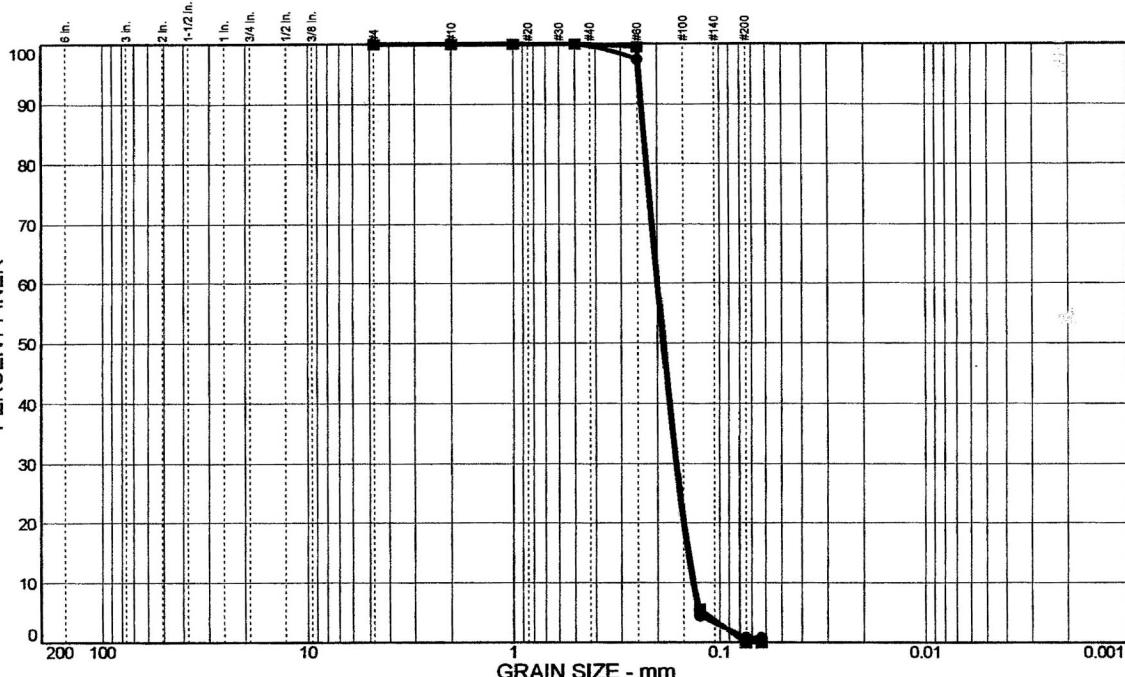
Project No.: 04-2011

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9

# Particle Size Distribution Report

PERCENT FINER



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
●		99.2		0.8	SP			
■		100.0		0.0 0.0	SP			

SIEVE inches size	PERCENT FINER		
	●	■	
<del>          </del>			
D <sub>60</sub>	0.200	0.198	
D <sub>30</sub>	0.163	0.161	
D <sub>10</sub>	0.135	0.133	
<del>          </del>			
COEFFICIENTS			
C <sub>c</sub>	0.98	0.98	
C <sub>u</sub>	1.48	1.48	

SIEVE number size	PERCENT FINER		
	●	■	
#4	100.0	100.0	
#10	100.0	100.0	
#18	100.0	100.0	
#35	100.0	100.0	
#60	97.4	99.5	
#120	4.4	5.5	
#200	0.8	0.0	
#230	0.8	0.0	

SOIL DESCRIPTION
● Poorly graded sand
■ Poorly graded sand

REMARKS:
● Classification based on grainsize only
■ Classification based on grainsize only

- Source: SB
- Source: SB

Sample No.: 2+8

Sample No.: 2+12

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Client: SAIC

Project: Half Moon Bay & South Beach Sampling June 2004

Project No.: 04-2011

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**APPENDIX E**

**RESULTS FROM THE KRUSKAL-WALLIS  
ANALYSIS OF VARIANCE**

## Transect HMB2

<b>HMB2+4</b>							
	Sampling Period	N	Mean	Ranksum	MW-U	Prob.	Chi Sq.
Annelida Abundance	Jan	3	0.0	6	0.000	0.037	4.360
	June	3	6.0	15			
Total No. of Taxa	Jan	3	1.7	6	0.000	0.043	4.091
	June	3	4.7	15			
Annelida No. Taxa	Jan	3	0.0	6	0.000	0.034	4.500
	June	3	4.0	15			
<b>HMB2+0</b>							
Miscellaneous Biomass	Jan	10	0.00100	80	25.000	0.05	4.500
	June	10	0.00300	130			
Arthropoda Abundance	Jan	10	2.2	77.5	22.500	0.035	4.448
	June	10	12.3	132.5			
Total No. of Taxa	Jan	10	4.9	67.5	12.500	0.004	8.145
	June	10	9.9	142.5			
Miscellaneous No. Taxa	Jan	10	1.1	67.5	12.500	0.002	9.173
	June	10	2.2	142.5			
Arthropoda No. Taxa	Jan	10	1.6	77	22.000	0.029	4.713
	June	10	3.2	133			

## Transect HMB3

<b>HMB3+8</b>							
	Sampling Period	N	Mean	Ranksum	MW-U	Prob.	Chi Sq.
No Significant differences among any endpoint							
<b>HMB3+4</b>							
No Significant differences among any endpoint							
<b>HMB3+0</b>							
No Significant differences among any endpoint							
<b>HMB3 -4</b>							
Annelida Biomass	Jan	3	0.00153	6	0.000	0.05	3.857
	June	3	0.02507	15			
Total Abundance	Jan	3	21.7	6	0.000	0.05	3.857
	June	3	36.3	15			
Miscellaneous No. Taxa	Jan	3	1.3	15	9.000	0.034	4.500
	June	3	0.0	6			
Mollusca No. Taxa	Jan	3	2.0	15	9.000	0.025	5.000
	June	3	1.0	6			
Annelida No. Taxa	Jan	3	2.3	6	0.000	0.046	3.971
	June	3	5.0	15			
<b>HMB3 -8</b>							
Miscellaneous Biomass	Jan	3	0.00793	15	9.000	0.05	3.857
	June	3	0.00103	6			
Total Abundance	Jan	3	208.3	15	9.000	0.05	3.857
	June	3	47.3	6			
Annelida Abundance	Jan	3	179.0	15	9.000	0.05	3.857
	June	3	23.7	6			
<b>HMB3 -12</b>							
Total Biomass	Jan	3	0.00227	6	0.000	0.05	3.857
	June	3	0.00700	15			
Total Abundance	Jan	3	14.7	6	0.000	0.05	3.857
	June	3	164.3	15			
Annelida Abundance	Jan	3	3.7	6	0.000	0.046	3.971
	June	3	150.3	15			
Total No. of Taxa	Jan	3	3.3	6	0.000	0.05	3.857
	June	3	7.0	15			

## Transect HMB4

<b>HMB4+12</b>							
	Sampling Period	N	Mean	Ranksum	MW-U	Prob.	Chi Sq.
No Significant differences among any endpoint							
<b>HMB4+8</b>							
Miscellaneous Abundance	Jan	10	7.7	140.5	85.500	0.007	7.323
	June	10	3.6	69.5			
Annelida Abundance	Jan	10	0.1	61.5	6.500	0.000	12.41
	June	10	3.1	148.5			
Total No. of Taxa	Jan	10	1.1	70	15.000	0.002	9.404
	June	10	1.8	140			
Annelida No. Taxa	Jan	10	0.1	65	10.000	0.000	12.16
	June	10	0.9	145			
<b>HMB4+4</b>							
Miscellaneous Biomass	Jan	3	0.00330	6	0.000	0.049	3.857
	June	3	0.00113	15			
Total Abundance	Jan	3	8.7	6	0.000	0.05	3.857
	June	3	16.0	15			
Annelida Abundance	Jan	3	0.7	6	0.000	0.046	3.971
	June	3	7.0	15			
Annelida No. Taxa	Jan	3	0.7	6	0.000	0.043	4.091
	June	3	2.7	15			
<b>HMB4+0</b>							
Miscellaneous Abundance	Jan	3	30	15	9.000	0.049	3.857
	June	3	6.7	6			
Annelida Abundance	Jan	3	0.67	6	0.000	0.046	3.971
	June	3	6.7	15			

<b>HMB4 -4</b>							
	Sampling Period	N	Mean	Ranksum	MW-U	Prob.	Chi Sq.
Miscellaneous Biomass	Jan	3	0.00153	15	9.000	0.046	3.971
	June	3	0.00020	6			
Mollusca Biomass	Jan	3	0.01217	6	0.000	0.037	4.355
	June	3	0.00117	15			
Total Abundance	Jan	3	14.7	6	0.000	0.05	3.857
	June	3	104.7	15			
Mollusca Abundance	Jan	3	0.0	6	0.000	0.037	4.355
	June	3	11.0	15			
Arthropoda Abundance	Jan	3	2.0	6	0.000	0.05	3.857
	June	3	57.0	15			
Annelida Abundance	Jan	3	8.0	6	0.000	0.046	3.971
	June	3	34.0	15			
Total No. of Taxa	Jan	3	4.3	6	0.000	0.05	3.857
	June	3	14.0	15			
Mollusca No. Taxa	Jan	3	0.0	6	0.000	0.034	4.500
	June	3	1.3	15			
Arthropoda No. Taxa	Jan	3	1.7	6	0.000	0.05	3.857
	June	3	7.0	15			
Annelida No. Taxa	Jan	3	1.7	6	0.000	0.043	4.091
	June	3	4.7	15			
<b>HMB4 -12</b>							
Mollusca Biomass	Jan	3	0.00001	6	0.000	0.037	4.355
	June	3	0.02203	15			
Arthropoda Biomass	Jan	3	0.00001	6	0.000	0.037	4.355
	June	3	0.00057	15			
Total Abundance	Jan	3	42.0	6	0.000	0.05	3.857
	June	3	287.3	15			
Mollusca Abundance	Jan	3	0.0	6	0.000	0.034	4.500
	June	3	1.3	15			
Arthropoda Abundance	Jan	3	0.0	6	0.000	0.025	5.000
	June	3	1.0	15			
Annelida Abundance	Jan	3	6.0	6	0.000	0.05	3.857
	June	3	257.0	15			
Mollusca No. Taxa	Jan	3	0.0	6	0.000	0.034	4.500
	June	3	1.3	15			
Arthropoda No. Taxa	Jan	3	0.0	6	0.000	0.025	5.000
	June	3	1.0	15			

## Transect HMB5

<b>HMB5+12</b>								
	Sampling	Period	N	Mean	Ranksum	MW-U	Prob.	Chi Sq.
Total Biomass	Jan	3	0.00110	15	9.00	0.046	3.971	
	June	3	0.00013	6				
Miscellaneous Biomass	Jan	3	0.00110	15	9.00	0.046	3.971	
	June	3	0.00007	6				
<b>HMB5+8</b>								
Miscellaneous Biomass	Jan	3	0.0	6	0.00	0.046	3.971	
	June	3	0.00100	15				
Total Abundance	Jan	3	3.0	6	0.00	0.046	3.971	
	June	3	14.0	15				
Miscellaneous Abundance	Jan	3	2.7	6	0.00	0.046	3.971	
	June	3	11.0	15				
<b>HMB5+4</b>								
No Significant differences among any endpoint								
<b>HMB5+0</b>								
Mollusca Biomass	Jan	3	0.00017	15	9.00	0.043	4.090	
	June	3	0.00001	6				
Mollusca Abundance	Jan	3	1.30000	15	9.00	0.034	4.500	
	June	3	0.00000	6				
Mollusca No. Taxa	Jan	3	1.30000	15	9.00	0.034	4.500	
	June	3	0.0	6				
<b>HMB5 -4</b>								
Total No. of Taxa	Jan	3	5.0	6	0.00	0.037	4.355	
	June	3	8.0	15				

<b>HMB5 -8</b>								
	Sampling Period	N	Mean	Ranksum	MW-U	Prob.	Chi Sq.	
Mollusca Biomass	Jan	10	0.0	60	5.00	0.000	13.911	
	June	10	0.00056	150				
Arthropoda Biomass	Jan	10	0.00020	66.5	11.50	0.003	8.554	
	June	10	0.00166	143.5				
Total Abundance	Jan	10	19.1	65	10.00	0.002	9.157	
	June	10	48.1	145				
Mollusca Abundance	Jan	10	0.0	60	5.00	0.000	13.911	
	June	10	3.5	150				
Arthropoda Abundance	Jan	10	3.5	76.5	21.50	0.030	4.694	
	June	10	12.5	133.5				
Annelida Abundance	Jan	10	6.9	66	11.00	0.003	8.744	
	June	10	19.8	144				
Total No. of Taxa	Jan	10	4.3	61	6.00	0.001	11.181	
	June	10	10.3	149				
Mollusca No. Taxa	Jan	10	0.0	60	5.00	0.000	13.911	
	June	10	1.1	150				
Arthropoda No. Taxa	Jan	10	0.8	72	17.00	0.007	7.160	
	June	10	2.4	138				
Annelida No. Taxa	Jan	10	2.6	67	12.00	0.004	8.422	
	June	10	5.6	143				
<b>HMB5 -12</b>								
Total Biomass	Jan	3	0.00263	6	0.000	0.05	3.857	
	June	3	0.01117	15				
Annelida Biomass	Jan	3	0.00030	6	0.000	0.046	3.971	
	June	3	0.00647	15				
Total Abundance	Jan	3	8.3	6	0.000	0.05	3.857	
	June	3	265.3	15				
Miscellaneous Abundance	Jan	3	6.3	6	0.000	0.05	3.857	
	June	3	63.7	15				
Annelida Abundance	Jan	3	1.7	6	0.000	0.05	3.857	
	June	3	198.0	15				
Total No. of Taxa	Jan	3	2.0	6	0.000	0.05	3.857	
	June	3	8.0	15				
Annelida No. Taxa	Jan	3	0.7	6	0.000	0.046	3.971	
	June	3	5.0	15				

## Transect SB1

<b>SB1+12</b>								
	Sampling	Period	N	Mean	Ranksum	MW-U	Prob.	Chi Sq.
Total Biomass	Jan	3	0.02240		15	9.00	0.050	3.857
	June	3	0.00047		6			
Arthropoda Biomass	Jan	3	0.01713		15	9.00	0.037	4.355
	June	3	0.0		6			
Total Abundance	Jan	3	38		15	9.00	0.046	3.971
	June	3	1.3		6			
Miscellaneous Abundance	Jan	3	25		15	9.00	0.046	3.971
	June	3	0.3		6			
Arthropoda Abundance	Jan	3	3		15	9.00	0.034	4.500
	June	3	0.0		6			
Annelida Abundance	Jan	3	10		15	9.00	0.046	3.971
	June	3	0.3		6			
Total No. of Taxa	Jan	3	4		15	9.00	0.046	3.971
	June	3	1.3		6			
Arthropoda No. Taxa	Jan	3	1		15	9.00	0.025	5.000
	June	3	0.0		6			
<b>SB1+8</b>								
Miscellaneous Biomass	Jan	3	0.00037		6	0.00	0.046	3.971
	June	3	0.00273		15			
Arthropoda Biomass	Jan	3	0.0057		6	0.00	0.050	3.857
	June	3	0.0276		15			
Total Abundance	Jan	3	12		6	0.00	0.050	3.857
	June	3	90.7		15			
Miscellaneous Abundance	Jan	3	5.3		6	0.00	0.050	3.857
	June	3	68.0		15			
Arthropoda Abundance	Jan	3	6		6	0.00	0.050	3.857
	June	3	20.7		15			
<b>SB1+4</b>								
Annelida Biomass	Jan	3	0.0016		6	0.00	0.049	3.857
	June	3	0.02623		15			
<b>SB1+0</b>								
Total Biomass	Jan	3	0.04997		15	9.00	0.050	3.857
	June	3	0.00707		6			
Miscellaneous Biomass	Jan	3	0.0005		6	0.00	0.050	3.857
	June	3	0.00433		15			
Mollusca Biomass	Jan	3	0.04593		15	9.00	0.037	4.355
	June	3	0.00001		6			
Total Abundance	Jan	3	12.3		6	0.00	0.049	3.857
	June	3	162.0		15			
Miscellaneous Abundance	Jan	3	5.3		6	0.00	0.049	3.857
	June	3	148.0		15			
Mollusca Abundance	Jan	3	1.3		15	9.00	0.034	4.500
	June	3	0.0		6			
Mollusca No. Taxa	Jan	3	1.0		15	9.00	0.025	5.000
	June	3	0.0		6			

## Transect SB2

<b>SB2+12</b>								
	Sampling	Period	N	Mean	Ranksum	MW-U	Prob.	Chi Sq.
Total Biomass	Jan	3	0.004		15	9.000	0.05	3.857
	June	3	0.0008		6			
Miscellaneous Biomass	Jan	3	0.00397		15	9.000	0.05	3.857
	June	3	0.00047		6			
Total Abundance	Jan	3	50.3		15	9.000	0.05	3.857
	June	3	4.7		6			
Miscellaneous Abundance	Jan	3	44.7		15	9.000	0.046	3.971
	June	3	0.3		6			
<b>SB2+8</b>								
Total Biomass	Jan	3	0.00213		6	0.000	0.05	3.857
	June	3	0.21367		15			
Arthropoda Biomass	Jan	3	0.00153		6	0.000	0.05	3.857
	June	3	0.02683		15			
Annelida Biomass	Jan	3	0.00003		6	0.000	0.046	3.971
	June	3	0.18463		15			
Total Abundance	Jan	3	15.7		6	0.000	0.05	3.857
	June	3	76.7		15			
Miscellaneous Abundance	Jan	3	9.0		6	0.000	0.05	3.857
	June	3	44.7		15			
Arthropoda Abundance	Jan	3	6.0		6	0.000	0.05	3.857
	June	3	24.3		15			
Annelida Abundance	Jan	3	0.7		6	0.000	0.043	4.091
	June	3	7.7		15			
<b>SB2+4</b>								
Total Biomass	Jan	3	0.00157		6	0.000	0.046	3.971
	June	3	0.0124		15			
Arthropoda Biomass	Jan	3	0.00117		6	0.000	0.049	3.857
	June	3	0.00613		15			
Annelida Biomass	Jan	3	0.00003		6	0.000	0.046	3.971
	June	3	0.00387		15			
Annelida Abundance	Jan	3	0.3		6	0.000	0.043	4.901
	June	3	4.7		15			
Total No. of Taxa	Jan	3	2.3		6	0.000	0.046	3.971
	June	3	5.0		15			
Annelida No. Taxa	Jan	3	0.3		6	0.000	0.043	4.901
	June	3	2.7		15			
<b>SB2+0</b>								
Total Abundance	Jan	3	22.7		6	0.000	0.046	3.971
	June	3	103.0		15			
Miscellaneous Abundance	Jan	3	22.7		6	0.000	0.046	3.971
	June	3	97.7		15			
Total No. of Taxa	Jan	3	1		6	0.000	0.037	4.355
	June	3	5.3		15			

**APPENDIX F**

**FISH GUT CONTENT ANALYSIS RESULTS**

**Appendix F. Fish stomach content summary.**

**Chinook Salmon**

	1	2
Count	10	10
Avg. Fork Length(mm)	83.1*	81.6*
Avg. Whole gut weight(g)	0.28	0.23
Avg. Prey weight(g)	0.07	0.06
Avg. Digested material weight(g)	0.05	0.02
Avg. Fullness Code	3	3.40
Avg. Digestion Code	2.80	2.60

Species Count of Stomach Content			Phylum	Subphylum	Class	Subclass	Order	Suborder	Family	Genus	Species
Arachnida Adult	1	0	Arthropoda	Chelicerata	Arachnida						
Podon sp. Adult	16	0	Arthropoda	Crustacea	Branchiopoda	Phyllopoda	Diplostraca	Cladocera	Polyphemidae	<i>Podon</i>	
Brachyura Zoea	24	21	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Brachyura			
Calliopidae Adult	2	4	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridea	Calliopidae		
Caprellidae Adult	8	4	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Caprellidea	Caprellidae		
Corophium sp. Adult	2	6	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridea	Corophiidae	<i>Corophium</i>	
Erichthonius sp. Adult	1	0	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridea	Corophiidae	<i>Erichthonius</i>	
Idoteidae Adult	2	0	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Isopoda	Valvifera	Idoteidae		
Jassa spp. Adult	326	248	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridea	Ischyroceridae	<i>Jassa</i>	
Jassa spp. Juvenile	1	1	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridea	Ischyroceridae	<i>Jassa</i>	
Paguridae Juvenile	0	2	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocymata	Paguridae		
Paracallioopiella pratti	5	1	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridea	Paracallioipedae	<i>Paracallioopiella</i>	<i>pratti</i>
Syndotea sp. Juvenile	0	1	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Isopoda	Valvifera	Idoteidae	Syndotea	
Calanoida Adult	1	0	Arthropoda	Crustacea	Maxillopoda	Copepoda	Calanoida				
Cirripedia legs	0	12	Arthropoda	Crustacea	Maxillopoda	Theocostraca	Cirripedia (infraclass)				
Ostracoda Adult	1	0	Arthropoda	Crustacea	Ostracoda						
Chironomidae Adult	42	4	Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Nematocera	Chironomidae		
Diptera Adult	11	34	Arthropoda	Hexapoda	Insecta	Pterygota	Diptera				
Diptera Larvae	1	0	Arthropoda	Hexapoda	Insecta	Pterygota	Diptera				
Diptera Pupae	1	0	Arthropoda	Hexapoda	Insecta	Pterygota	Diptera				
Hemiptera Adult	1	0	Arthropoda	Hexapoda	Insecta	Pterygota	Hemiptera				
Mytilidae Juvenile	1	0	Mollusca	-	Bivalvia	Pteromorpha	Mytiloida	-	Mytilidae		
Nemertea Indet. Juvenile	1	1	Nemertea								
Chlorophyta pieces	0	4									
Vegetation seeds	0	67									

**Starry Flounder**

	1	2
Count	4	2
Avg. Total Length(mm)	166.00	180.50
Avg. Whole gut weight(g)	1.19	1.06
Avg. Prey weight(g)	0.44	0.39
Avg. Digested material weight(g)	0.10	0.05
Avg. Fullness Code	1.33	2
Avg. Digestion Code	4	4

Species Count of Stomach Content		Phylum	Subphylum	Class	Subclass	Order	Suborder	Family	Genus	Species	
Terebellidae Adult	1	0	Annelida	-	Polychaeta	Palpata	Canalipalpata	Terebellida	Terebellidae		
Onuphis sp. Adult	0	1	Annelida	-	Polychaeta	Palpata	Aciculata	Eunicida	Onuphidae	<i>Onuphis</i>	
Emerita analoga Adult	1	0	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocymata	Hippidae	<i>Emerita</i>	<i>analoga</i>
Siliqua patula Juvenile	1	0	Mollusca	-	Bivalvia	Heterodontia	Veneroida	-	Pharidae	<i>Siliqua</i>	<i>patula</i>
Tellina nuculoides Adult	1	0	Mollusca	-	Bivalvia	Heterodontia	Veneroida	-	Tellinidae	<i>Tellina</i>	<i>nuculoides</i>

### Surf Smelt (\*\*)

Site	1	2	2?
Count	4	3	1
Avg. Total Length(mm)	91.50	89.00	150.00
Avg. Whole gut weight(g)	0.21	0.11	0.84
Avg. Prey weight(g)	0.01	0.01	0.11
Avg. Digested material weight(g)	0.02	0.01	0.10
Avg. Fullness Code	2.75	3	-
Avg. Digestion Code	3	2.33	-

#### Species Count of Stomach Content

	Phylum	Subphylum	Class	Subclass	Order	Suborder	Family	Genus	Species
Spionidae Juvenile	Annelida	-	Polychaeta	Palpata	Canalipalpata	Spionida	Spionidae		
Evadne sp. Adult	Arthropoda	Crustacea	Branchiopoda	Phyllopoda	Diplostraca	Cladocera	Polyphemidae	Evadne	
Podon sp. Adult	Arthropoda	Crustacea	Branchiopoda	Phyllopoda	Diplostraca	Cladocera	Polyphemidae	Podon	
Brachyura Zoea	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Brachyura			
Calanoida Adult	Arthropoda	Crustacea	Maxillopoda	Copepoda	Calanoida				
Cirripedia cypris larvae	Arthropoda	Crustacea	Maxillopoda	Theocostraca	Cirripedia (infraclass)				
Cirripedia nauplii	Arthropoda	Crustacea	Maxillopoda	Theocostraca	Cirripedia (infraclass)				
Corycaeus anglicus	Arthropoda	Crustacea	Maxillopoda	Copepoda	Poecilostomatoida	-	Corycaeidae	Corycaeus	anglicus
Bivalvia Juvenile	Mollusca	-	Bivalvia						
Gastropoda Juvenile	Mollusca	-	Gastropoda						
Chlorophyta pieces		4							
Unidentified Fish Egg	1	95	0						

### Shiner Perch

Site	1	2
Count	2	2
Avg. Total Length(mm)	109.00	109.00
Avg. Whole gut weight(g)	0.51	0.50
Avg. Prey weight(g)	-	-
Avg. Digested material weight(g)	0.11	-
Avg. Fullness Code	0.50	0.00
Avg. Digestion Code	4.50	5.00

#### Species Count of Stomach Content

0      0

### Speckled Sanddab

Site	1	2
Count	1	1
Avg. Total Length(mm)	72.00	80.00
Avg. Whole gut weight(g)	0.04	0.06
Avg. Prey weight(g)	-	-
Avg. Digested material weight(g)	-	-
Avg. Fullness Code	0	0
Avg. Digestion Code	5	5

#### Species Count of Stomach Content

0      0

**Sand-Lance**

Site	1
Count	4
Avg. Total Length(mm)	109.00
Avg. Whole gut weight(g)	0.08
Avg. Prey weight(g)	0.01
Avg. Digested material weight(g)	0.01
Avg. Fullness Code	2
Avg. Digestion Code	2.75

Species Count of Stomach Content		Phylum	Subphylum	Class	Subclass	Order	Suborder	Family	Genus	Species
Evadne sp. Adult	30	Arthropoda	Crustacea	Branchiopoda	Phyllopoda	Diplostraca	Cladocera	Polyphemidae	Evadne	
Podon sp. Adult	7	Arthropoda	Crustacea	Branchiopoda	Phyllopoda	Diplostraca	Cladocera	Polyphemidae	Podon	
Brachyura Zoa	27	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Brachyura			
Calanoida Adult	398	Arthropoda	Crustacea	Maxillopoda	Copepoda	Calanoida				
Corycaeus anglicus	7	Arthropoda	Crustacea	Maxillopoda	Copepoda	Poecilostomatoida	-	Corycaeidae	Corycaeus	anglicus

**English Sole**

Site	1
Count	10
Avg. Total Length(mm)	59.70
Avg. Whole gut weight(g)	0.05
Avg. Prey weight(g)	0.01
Avg. Digested material weight(g)	0.00
Avg. Fullness Code	2.10
Avg. Digestion Code	3.20

Species Count of Stomach Content		Phylum	Subphylum	Class	Subclass	Order	Suborder	Family	Genus	Species
Glycinde armigera Juvenile	5	Annelida	-	Polychaeta	Palpata	Aciculata	Phyllodocida	Goniadiidae	Glycinde	armigera
Nephtys californiensis Adult	1	Annelida	-	Polychaeta	Palpata	Aciculata	Phyllodocida	Nephtyidae	Nephtys	californiensis
Nephtys californiensis Juv.	2	Annelida	-	Polychaeta	Palpata	Aciculata	Phyllodocida	Nephtyidae	Nephtys	californiensis
Opheliidae Juvenile	14	Annelida	-	Polychaeta	Scolecida	-	-	Opheliidae		
Phyllodocidae Juvenile	1	Annelida	-	Polychaeta	Palpata	Aciculata	Phyllodocida	Phyllodocidae		
Spionidae Adult	1	Annelida	-	Polychaeta	Palpata	Canalipalpata	Spionida	Spionidae		
Spionidae Juvenile	14	Annelida	-	Polychaeta	Palpata	Canalipalpata	Spionida	Spionidae		
Eogammarus sp. Adult	1	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridea	Gammaridae	Eogammarus	
Jassa spp. Adult	2	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridea	Ischyroceridae	Jassa	
Lampropidae Adult	1	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	-	Lampropidae		
Oedicerotidae Adult	2	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridea	Oedicerotidae		
Pacifoculodes sp. Adult	5	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridea	Oedicerotidae	Pacifoculodes	
Harpacticoida Adult	1	Arthropoda	Crustacea	Maxillopoda	Copepoda	Harpacticoida				
Bivalvia siphon	1	Mollusca	-	Bivalvia						
Tellina sp. Juvenile	4	Mollusca	-	Bivalvia	Heterodontia	Veneroida	-	Tellinidae	Tellina	

### Pacific Herring

Site	2
Count	1
Avg. Total Length(mm)	110.00
Avg. Whole gut weight(g)	0.51
Avg. Prey weight(g)	0.00
Avg. Digested material weight(g)	0.03
Avg. Fullness Code	4
Avg. Digestion Code	4

Species Count of Stomach Content	Phylum	Subphylum	Class	Subclass	Order	Suborder	Family	Genus	Species
Cirripedia cypris larvae	4	Arthropoda	Crustacea	Maxillopoda	Theocostraca	Cirripedia (infraclass)			

### American Shad

Site	2
Count	3
Avg. Total Length(mm)	97.00
Avg. Whole gut weight(g)	0.14
Avg. Prey weight(g)	0.01
Avg. Digested material weight(g)	0.03
Avg. Fullness Code	2.33
Avg. Digestion Code	3

Species Count of Stomach Content	Phylum	Subphylum	Class	Subclass	Order	Suborder	Family	Genus	Species
Polychaeta Juvenile	1	Annelida	-	Polychaeta					
Evadne sp. Adult	19	Arthropoda	Crustacea	Branchiopoda	Phyllopoda	Diplostraca	Cladocera	Polyphemidae	Evadne
Podon sp. Adult	7	Arthropoda	Crustacea	Branchiopoda	Phyllopoda	Diplostraca	Cladocera	Polyphemidae	Podon
Brachyura Zoea	15	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Brachyura		
Calanoida Adult	340	Arthropoda	Crustacea	Maxillopoda	Copepoda	Calanoida			
Cirripedia cypris larvae	2	Arthropoda	Crustacea	Maxillopoda	Theocostraca	Cirripedia (infraclass)			
Cirripedia nauplii	16	Arthropoda	Crustacea	Maxillopoda	Theocostraca	Cirripedia (infraclass)			
Corycaeus anglicus	14	Arthropoda	Crustacea	Maxillopoda	Copepoda	Poecilostomatoida	-	Corycaeidae	Corycaeus anglicus

### Sand Sole

Site	1
Count	2
Avg. Total Length(mm)	247.50
Avg. Whole gut weight(g)	2.37
Avg. Prey weight(g)	-
Avg. Digested material weight(g)	-
Avg. Fullness Code	0
Avg. Digestion Code	5

Species Count of Stomach Content
0